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A TREATISE ON TROPICAL THERAPEUTICS

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PREFACE

The first volume of a 'Treatise on Tropical Therapeutics' was published in 1950 in which the first four parts, that is, (i) General Considerations in Therapy (ii) Remedies used against Helminthic Diseases, (iii) Remedies used against Protozoal Diseases and (iv) Remedies used against Bacterial Diseases (partly) were discussed On account of circumstances beyond our control and the foreign tour of all the three authors at different periods during the intervening period, the second volume could not be published as early as we had hoped We are sorry for the inconvenience caused to the readers

In this volume consideration regarding remedies used in bacterial and virus diseases has been continued and the present status of knowledge about treatment of such diseases has been outlined Part VI of this volume deals with remedies used against Miscellaneous Tropical Diseases Part VII with Diseases of Blood and Blood forming Organs and Part VIII with Diseases of the Skin It is felt that the whole field of present day therapeutics is fairly covered within these chapters

In the Appendix effort has been made to prepare an alphabetical list of diseases particularly of tropical interest with their drug treatments This is likely to be of great 'ready reference' value to busy practitioners and teachers The delay in publication of the Second Volume has necessitated the addition of a 'Supplement' at the end where an effort has been made to bring the subject matter in the different sections of the book up to date This will obviate the need for reference to recent literature after 1950 It is realised that at no time it is possible to bring a book really up to date in the true sense of the term as there is always a big interval in India between the time of completion and editing of a book to its final printing

For the sake of convenience of the readers, both the volumes will be available in bound form as one volume with a combined Index

We are grateful to Dr S C Bhattacharya for seeing the volume through the press at Calcutta

Drug Research Laboratory
Jammu, Kashmir State
Central Drug Research Institute,
Lucknow
January, 1954

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I C CHOPRA

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CHAPTER IV

BOWEL DISEASES

GENERAL CONSIDERATION AND CLASSIFICATIONS INTESTINAL FLORA INTESTINAL ANTISEPTICS—ACUTE BACILLARY DYSENTERY EPIDEMIOLOGY DYSENTERY CARRIERS TRANSMISSION BY FLIES SEASONAL INCIDENCE—AETIOLOGY BACTERIOLOGY PATHOLOGY—CLINICAL ASPECTS CLINICAL TYPES SYMPTOMATOLOGY ATYPICAL FORMS COMPLICATIONS AND SEQUELAE—PROGNOSIS—DIAGNOSIS SEROLOGICAL TESTS—THERAPY CURATIVE AND SUPPORTIVE THERAPY CATHARSIS SULPHONAMIDE DRUGS SULPHONAMIDE IN CARRIERS BACTERIOPHAGE BACTERIAL ANTAGONISTS ANTIDYSENTERY SERUM—DIET VITAMINS PALLIATIVE DRUG THERAPY—PROPHYLAXIS VACCINATION GENERAL METHODS—CHRONIC BACILLARY DYSENTERY—COLITIS—CHRONIC DYSENTERY—CHRONIC ULCERATIVE COLITIS AETIOLOGY PATHOLOGY CLINICAL ASPECTS DIAGNOSIS PROGNOSIS TREATMENT GENERAL AND MEDICINAL SURGICAL—CHRONIC DISTAL ILEITIS—HILL DIARRHOEA—CHRONIC GASTRO-INTESTINAL DISTURBANCE IN INDIA—ENTERIC FEVER TYPHOID FEVER PARATYPHOID—CHOLERA—FOOD POISONING

1. General Consideration and Classification

(1) Intestinal flora

The varying conditions of oxygen tension and reactions physical, optical and chemical in different levels of the alimentary canal favour the growth of different types of organisms at the various levels of the intestines The mouth offers an aerobic area, although the various crevices between the teeth in the folds of the mucous membrane and the crypts of the tonsils anaerobic organisms flourish In the stomach if the acidity of the gastric juice is normal most bacteria are killed unless otherwise protected There appear to be very few organisms in duodenum and upper jejunum below this the organisms increase and reach their maximum in the large intestine Certain conditions influence the normal bacterial flora of the intestine e g the degree of digestion of the food the proportion of unaltered carbohydrates and protein at different levels of the gut etc The products of bacterial growth at one level of the colon will also influence the growth of other types of organisms in the same level and further down Although a new invader may sometime succeed in establishing a foot hold at some level in the gut it has to encounter other bacteria at lower levels and unless conditions are particularly favourable it will be readily overpowered by the more adapted intestinal bacteria In the colon and rectum many of the bacteria die out as a result of the gradual loss of water The presence of bacteriophage also helps to maintain an equilibrium between man and his intestinal bacteria

At birth there are no bacteria in the intestine the meconium is sterile unles infection has taken place as a result of some general infection in the mother ... ey are chance contamin... various kinds (staphylo...) In a few days after ... which is modified under ... arties changes in diet

Principal types & variations

intestinal infections The principal types of intestinal flora are *Lactobacillus bifidus, Lactobacillus acidophilus, Streptococcus faecalis,* certain sporebearing aerobes and anaerobes coliform and other allied organisms The intestinal flora varies with the conditions of life In breast fed infants the duodenum contains streptococcus while in the rest of the gut coliform organisms and *Lactobacillus bifidus* are common In the artificially fed infants Gram negative organisms are numerous and putrefactive bacteria are relatively more common The duodenum of a normal person is relatively sterile except during digestion In the upper part of the small intestine cocci predominate and the lower part contains an abundance of coliform organisms and spore bearing proteolytic aerobes The large intestine contains certain proteolytic anaerobes and aerobes, yeasts moulds and spirilli

The intestinal flora is however subject to wide variations In infections with cholera and dysentery the specific infecting organisms may dominate the intestinal flora Changes in diet such as increase of carbohydrates may lead to a preponderance of intestinal flora of *Lactobacillus acidophilus* type Milk and vegetable proteins produce much less putrefaction Purgative and the so called intestinal antiseptic group have no appreciable effect on the intestinal flora Though direct entrance of the bacteria to the gastro intestinal canal is no doubt the most important route by which infection occurs, it has been argued that infection may occur also through other channels If bacteria are injected parenterally they can be found in the bile, and if the bile duct is tied certain bacteria are eliminated through the intestinal mucosa

Modes of entry

Foster and his co workers (1908) in their study of the mode of infection of the intestinal canal with typhoid bacilli put forward the view that the bacilli enter the circulation possibly through the tonsils They multiply in the blood pass through the liver and gain access to the gall bladder where they set up a catarrhal inflammation and thence infect the intestine They showed that when typhoid bacilli [illegible] into animals the organisms were found mainly in the [illegible] for weeks *E typhosa* could be isolated from [illegible] the incubation period before any manifestations of disease appeared [illegible] they could be isolated from the intestine On autopsy the bacilli were always present in the gall bladder and the upper parts of the intestine but were frequently absent in the lower part of the intestine

Gastric acidity

Teal (1934) investigated the problem of bacterial infection of the intestinal canal He administered the bacteria to animals by different channels and noted the results It was found that bacteria can find their way to the tissues through the bucco pharyngeal mucous membrane without any breach occuring on the surface They multiply in the neighbouring lymphatic glands enter the blood stream and from there reach the intestinal mucosa and are excreted along its entire length Most of the organisms when given by the mouth are destroyed by the gastric juice because the intestinal bacilli are incapable of long survival in an acid medium When the pH is considerably lower than 3 to 4, death of bacteria occurs rapidly A small number may however pass alive through the pylorus and reach the intestine When the organisms are injected directly into the intestine at places where the acidity is neutralised the bacteria may survive for a considerable time but the normal healthy mucosa as a rule does not allow their passage readily and those that pass through are rapidly destroyed in the lymphatic glands It has been shown that germicidal activity in these cases is not due to the acidity of the gastric juice but to other factors e g, the sterilizing effect of the succus entericus, the presence of normal non pathogenic organisms

in the gut however plays an important part in inhibiting the growth of pathogenic bacteria

Impermeability of mucosa

Another important consideration in this connection is the impermeability of the healthy mucosa to intestinal organisms This property probably comes into play in nearly all cases If however the mucous membrane is injured the passage of organisms through it is facilitated It is under exceptional conditions that the intestinal mucosa becomes permeable to living bacteria It thus appears that sufficient protection exists in nature for the prevention of intestinal infections In cases of typhoid fever infection is caused by the bacteria escaping the action of hydrochloric acid in the stomach This occurs when they are hurried through the stomach in a large quantity of water or in the presence of some organic envelope or by hypochlorhydria temporary or permanent In the intestine some alteration in the permeability or resistance of the mucosa brought on by such factors as injudicious diet contaminated food and conditions reflexly altering [illegible] tion In [illegible] passage [illegible] asion of the blood stream In bacillary dysentery infection occurs through the oral route

Effect of toxins

The toxins of *shiga bacillus* are not destroyed in the gastro intestinal tract The exotoxin is absorbed into the blood stream and can cause typical damage to the capillary en [illegible] the endotoxin [illegible] The living bac[illegible] cous membrane and allow multiplication of the organisms In the case of cholera ingestion of the bacilli is necessary for the production of the disease Although this is true there seem to be certain conditions which modify an infection The state of health of an individual and the degree of acidity of the stomach contents determine to a great extent the susceptibility or otherwise to an infection

Dietary

General management The rationale of the treatment of bacterial infection of the intestine properly considered is the management of the patient rather than of the disease Every attempt should be made to increase the patient s resistance Constipation is to be particularly avoided Anything which lowers the neuro muscular tone of the intestinal wall will contribute to the development of constipation Seasonal changes lack of essential food factors want of exercise excess of tobacco lack of efficient mastication and deficiency in the intake of fluid are important contributory factors Undoubtedly the nature of the dietary is of utmost importance So far as the food factor is concerned an adequate supply of fresh foodstuffs including an ample supply of vegetables and fruits is essential The nature of the diet is dependent upon the specific illness but in general it may be said that rough fibrous meat and fish and the coarser and harsher vegetables and fruits should be forbidden The softer forms of meat and fish and the simpler fruits and vegetables are permissible Sugars and sugar producing foods by reason of their fermentable qualities should be reduced The main articles of consumption should be restricted to milk (citrated if necessary) raw or lightly boiled eggs butter and cheese in moderate quantity [illegible]

[illegible] it can easily digest

Laxatives

In cases where the intestine is sluggish some laxative may be prescribed to empty the bowel The choice of laxatives in cases of stasis is not always easy because most of these drugs have no effect Liquid paraffin is suitable in some

cases, it should not, however, be used indiscriminately or persisted with too long because besides being
Some general metabc
may be prescribed as
any pathogenic organisms isolated from the fæces may be employed in conjunction with other remedies

(2) Intestinal antiseptics

Disinfection of bowel

It is generally admitted that ordinary antiseptics are of no value and with the exception of certain sulphonamide compounds there is no drug known which when administered by the mouth, will reduce the number of living bacteria in the stools Nevertheless, it is possible that some drugs may check or diminish *the growth of bacteria in the upper part of the intestine and thereby lessen the* absorption of toxic products With this idea disinfection of the alimentary canal has been advocated in many diseases such as cholera, typhoid dysentery, etc Normally the lower one third of the small intestine and the upper part of *the large intestine contain the largest number of bacteria, and the number of* living bacteria steadily diminishes further down in the colon Many experiments have been conducted to determine the bactericidal effect of various drugs on the intestinal flora Rogers (1913) tested the efficacy of certain inorganic and organic compounds of silver *copper and mercury and some other antiseptics on* Shiga s bacillus and concluded that silver compounds such as albergin gave the best results mercury and copper compounds being non effective Of the other antiseptics cyllin and izal are effective both in broth and in distilled water Phenol and the higher coal tar products have also an antiseptic property but most of them lose their activity in the presence of faeces and thus fail to exert any influence on the intestinal bacteria This can be readily understood if we consider the large number of bacteria present in the colon and the large mass of material in the intestine which tend to weaken the antiseptic property of the drugs Besides many of the so called intestinal antiseptics produce toxic symptoms in doses necessary to produce any bactericidal effect

There is another important point to be considered in this connection The normal defensive power of the healthy mucosa is always brought into action to deal with the bacteria present in the gut These drugs therefore may on the contrary do harm by injuring the intestinal mucosa This has been demonstrated by Schutz (1901) *who found that after* large doses of calomel the cholera vibrio persists in the intestinal canal of dogs for a longer period than when no drug is given

Although complete *intestinal asepsis is not practicable a relative asepsis is* not inconceivable though it has not been demonstrated satisfactorily The use of antiseptics at best, is inferior to other methods such as suitable modifications of diet and evacuation of the bowel Whenever any drug is used those antiseptics *should be preferred which are sparingly* soluble in water so that they will not be absorbed from the intestine to any appreciable extent In order that a drug may be useful as an intestinal antiseptic it must exert the maximum effect on the colon where the action is desired without its action being hampered in the presence of organic matter ... the gastric
and intestinal mucosa and
produce toxic symptoms

Sulphonamide compounds
(see under sulphonamides)

Potassium permanganate It is an oxidising agent and disinfectant but its action is weakened by the presence of organic matter As a disinfectant to the intestinal canal it was used by Rogers in cholera In order to destroy the toxins in cholera the doses recommended are as much as 50 gr a day This is given in the form of pills made up with vaseline in doses of 2 gr every fifteen minutes for two hours then every half hour till the stools are coloured green Large doses of the drug produce toxic symptoms and hence it should always be used with caution

Intestinal antiseptics

Kaolin This compound is the native white aluminium silicate purified by elutriation from sandy matter, another variety of it is known as Fuller's earth Kaolin and Fuller's earth are adsorbents and as such have the power of adsorbing various soluble substances and suspended matters The drug has been largely used in diarrhoea dysentery and cholera It is not a direct disinfectant of the alimentary canal but is believed to adsorb bacterial toxins and affords a mechanical protection for the inflamed mucous membrane

Salicylic compounds Of these salol (phenyl salicylate) is largely used as an intestinal antiseptic It is non irritant to the stomach and is broken up liberating phenol and salicylic acid The phenol component is thought to be valuable from the point of view of its effect on the disinfection of the gut but the decomposition is so slow and the absorption of phenol is so rapid that its usefulness is very limited When given by the mouth nearly 10 per cent or more is excreted unchanged in the faeces when administered in a capsule it may be found in the faeces as crystals formed by partial fusion and recrystallisation of the drug It is therefore advisable to give it in the form of an emulsion or with some indifferent powder The dose is 5 to 20 gr by the mouth It has been largely prescribed in typhoid fever, but it is doubtful whether it has any effect on the disease

Phenol and its derivatives The substances of this group are highly bactericidal The higher coal tar products have great germicidal power and they have a much feebler toxic action when given by the mouth as compared with phenol Some of these compounds such as tetrachlor phenol o cresol tetra brom o cresol have very high phenol coefficients but they lose their disinfectant property in the presence of organic matter and hence are not used therapeutically

A few benzol derivatives have been used internally (Naphthalene and the less irritating related compounds are among the most effective) Alpha naphthol is highly toxic and is not employed, beta naphthol acts similarly to phenol but is more germicidal It is given in doses of 3 to 10 gr and as much as 10 to 15 gr may be given in a single dose but it is liable to set up gastric disturbances and upset digestion Other preparations such as benzonaphthol and naphthol bismuth have also been used

[illegible]

insoluble salts will do it A small amount may however be dissolved and exert an astringent and mild antiseptic action Bismuth carbonate and subnitrate are generally used and may be prescribed either in the form of a powder or suspended with mucilage

Insoluble salts of mercury especially those which have a cathartic action have also some antiseptic property Calomel is a cholagogue purgative and is therefore useful in conditions of intestinal putrefaction e g in dysentery early cases of typhoid Bile is another substance which has been used as an antiseptic It is not a direct disinfectant of the gut contents but an indirect one by aiding digestion and helping absorption of foodstuff In cases of biliary obstruction with offensive stools bile is said to be useful Ox bile is a dark greenish brown substance somewhat bitter in taste It is prescribed in doses of 5 to 15 gr, the antiseptic value is however doubtful

Charcoal has been used as an intestinal antiseptic It has the power of adsorbing gases and this has led to its use [illegible] rial dysentery large doses are given 30 to 45 [illegible] *arbo animalis* or bone black is preferred for [illegible] the vegetable charcoal act as an irritant It [illegible] phtheria toxin and antitoxin are adsorbed by animal charcoal In general the toxins of the Gram positive bacteria are said to be more readily adsorbed than those of Gram negative ones It may therefore be advantageously prescribed in those cases associated with much bacterial fermentation in the intestinal canal

The carrier state in typhoid is a more serious problem than in bacillary dysentery partly because of the greater persistance of the organism and partly because of greater mortality in typhoid Serious epidemics have been caused by typhoid carriers in India The carrier state in food handlers has been responsible for a number of epidemics of bacillary and amoebic dysentery According to Craig the most common source of transmission of amoebiasis especially in large towns and cities with well controlled water supply and general sanitation are the carriers

Bacillary dysentery occurs in animals such as monkeys in captivity and Flexner bacilli have been isolated from healthy rabbits though these animals and mice cannot be infected by the oral route

(2) *Transmission by flies*—House flies can carry dysentery organisms and are important factors in transmission of the disease The maximum incidence of dysentery coincides with greatest fly prevalence Intestinal tract of flies is the chief source of *dysentery organism in infected flies the minimum period of survival in fly's intestine being* five days Flies may travel as much as eight miles from the point of liberation in one day and thus can carry infection a long distance

(3)
seasonal
its highes
cold weat
and Febr
March ca
when fly larvae are killed

Epidemics have been caused by infected milk and water borne outbreaks also occur Dysentery bacilli have been isolated from polluted water in bathing tanks and wells Dysentery organism can survive in water for a considerable time and Shiga bacillus has been recovered after four weeks from inoculated sterile water Water may thus play an important part in transmission of the disease though some authorities hold a contrary opinion

Sources of outbreaks

The most frequent sources of outbreaks are uncooked foods or food contaminated after sterilization Meat is implicated in very rare instances in contrast to Salmonella infections With *B enteritidis* symptoms follow within a few hours after ingestion in contrast to 12 to 36 hours incubation period of bacillary dysentery

Dysentery bacilli may survive in the soil as long as seven weeks if nutritive matter and moisture are present It is dangerous to use fresh night soil as manure for vegetable which are eaten without cooking

Gastric barrier in dysentery—As long as free acid is present in the stomach few viable bacteria can pass through The mucus secreted also enmeshes the bacteria and renders them inert The hydrogen ion concentration is chiefly responsible for the bactericidal action of gastric juice in the case of *B dysenteriae* In the human body infection with dysentery organism is determined primarily by the degree of acidity in the stomach at the *time of ingestion*

2. Aetiology

(1) *Bacteriology of Acute Bacillary Dysentery*

The bacteria causing dysentery belong to two main groups —

(1) Non mannite fermenter group

Causal organisms

(a) The Shiga bacillus or *Shigella dysenteriae* which gives rise to severe epidemic outbreaks especially in tropical and sub-tropical climates It is of a highly toxic nature and fatal cases occur

(b) *Sh ambigua* is identical with the Schmitz bacillus is an allied organism There was difference of opinion with regard to its pathogenecity but convincing evidence has been afforded by work in India Certain other non mannite fermenting organisms but which do not produce indol like *B dysenteriae* and Schmitz have been incriminated

(2) Mannite fermenters group

(a) Flexners bacillus or Boyd type—*Sh paradysenteriae* gives rise to less severe symptoms and does not become chronic

(b) *B alkalescens* was at first considered not to be pathogenic but evidence is accumulating to show its pathogenic nature It has been isolated in several outbreaks of enteric disease.

(c) Sonne-Duval bacillus—*Sh sonne* also produces a comparatively milder form of disease, but is resistant to treatment

Toxicity of the second group is very much less than the first group

Infections with these organisms can only be differentiated by agglutination tests Newcastle bacillus has been responsible for outbreaks in England.

Smooth and rough variants commonly occur in typhoid-paratyphoid-dysentery groups The normal form giving smooth colonies is called the 'S' (smooth) form and the variant giving rise to rough colonies are termed 'R' (rough) form Changes from 'S' to 'R' form are frequently irreversible In the majority of cases the changes from 'S' to 'R' is associated with loss of virulence as well as change in antigenic structure The variation from 'S' to 'R' are quite independent of variation from 'H' (flagellar) to 'O' (somatic) forms, for rough variants are often flagellated (Felsen)

Positive faecal cultures—Excretion of dysentery bacilli in the stools lasts for a week or so It has been shown that cultures made during the first three days from mucopurulent material in stools or during the first 7 to 10 days of direct mucosal crypt aspiration are practically always positive The latter method is more reliable in carriers or cases of chronic dysentery, before a patient is discharged from hospital at least three consecutive negative examinations should be obtained Felsen believes that dysentery organisms lodge in the depths of crypts of Lieberkuhn in order to escape the inimical flora of the intestines, but can be easily dislodged by mild suction Rectal or sigmoidal swab cultures are also successful

If stools cannot be bacteriologically examined immediately after collection these should be properly preserved with glycerine (in strength of 20 per cent of the stool) or 3 per cent sodium hydroxide

The dysentery organisms grow freely in all the usual laboratory media. On solid media, such as agar the colonies are semitranslucent and greyish Differentiation between the different members of the group is not possible by cultural characters.

The dysentery toxins—Shiga bacillus gives rise to a soluble toxin and an insoluble toxin present in bacterial bodies Both these are fatal to rabbits and guineapigs The Shiga organism produces a neurotoxin acting on the central nervous system of rabbits, an exotoxin and an endotoxin which is thermostable and produces intestinal lesions The to[illegible]
in[illegible]
ch[illegible]
ar[illegible]

Multiple infections—Multiple infections occur quite commonly and simultaneous presence of two o[illegible] [illegible]cially in India The clinical cours[illegible] strain There is some evidence [illegible] phoid infection the clinical course [illegible] Positive blood cultures are rare [illegible] pe may reveal no bacteraemia [illegible] complications, such as arthritis, pneumonia, thrombophlebitis and acute nephritis

3. Pathology

Pathological lesions—The pathological pictu[illegible] and *the severity of the infection* The lesio[illegible] of the intestines (rectum, pelvic colon and caec[illegible] few feet of the ilium may be affected In [illegible] only be slight catarrhal inflammation of the descending colon and rectum, which may become more pronounced when infection is severe Resolution occurs rapidly and if there is ulceration it is superficial

In Sh[illegible]
and[illegible]
yell[illegible]
fluid[illegible]
often not the mucosa.

In severe acute bacillary dysentery pathological lesions consist of massive coagulation necrosis of extensive areas of mucos
cases necrotic areas may top the
ulcers may destroy the entire mucos
is generally complete Stricture is
muscularis In later stages large 1
down to the muscularis

Lesions in the central nervous system are due to the neurotoxin

4. Clinical Aspects

Types

Clinical variations—All grades of immunity may exist in an individual and symptoms may show pictures of varying intensity Some infected individuals *may be completely* free from noteworthy symptoms and this is frequently seen in epidemics Atypical forms of disease are co ... ource
of a danger in ... ytoid
forms of acute ... and
afebrile) are als ... d is
not satisfactory ... not
tenable Flexner ... illus
Sonne Duval infe

(1) Clinical types

1 In the mild or moderately severe type, which occurs in healthy and well nourished people the symptoms may consist of simple diarrhoea stools being feculent, not too frequent and with no blood or mucus in them

2 In the severe type the onset is sudden, there are severe colicky pains and uncontrollable desire to empty bowel resulting in small painful motions which soon loose their fæcal character Abdominal tenderness and fever (100 to 104°F) toxæmia and coated tongue are present and there may be marked dehydration and dysuria.

3 Fulminating type is generally due to Shiga bacillus and occurs in persons with low general resistence The onset starts with a rigor and intense headache and ... mus Later grave toxaemia occurs ... of colon on account of damage to its ... may produce suppression of urine and the blood urea may rise to 150 mg ... 00 ccm

The aged and infants are particularly susceptible and in them the disease runs a severe course Acute bacillary dysentery does occur in the new born and in infants it has a high mortality rate

In India Cunningham and King divided bacillary dysentery into (1) Acute fulminating and rapidly fatal (2) Sub-acute most frequent and mild with tendency to recovery (3) Chronic dysentery *resulting from repeated attacks of sub-acute form running a protracted* course and having a bad prognosis

Incubation period and onset—The incubation period may be as short as 12 hours or even less but is generally between 24 to 48 hours

Symptoms may begin gradually or quite suddenly In the former case there is general malaise headache, muscle pains anorexia and nausea These are followed in 12 to 36 hours by typical intestinal manifestations There may be few or no prodromes A choleraic type with vomiting purging cramps and rice water stools has been described Diarrhoea prostration and pyrexia (105°F) in first 24 hours may occur

Toxaemia

In many instances systemic effe ... ntestinal symptoms
and signs as in the meningitic and
time may lapse before diarrhoea st
profuse diarrhoea and profound sy
toxins and protects the system Secretion of absorbed toxins occurs from the *blood back* into the gut, It is *believed that ulcers in the intestines are produced during* this phase A vicious cycle may thus be established in cases where profuse diarrhoea is absent.

(2) Symptomatology

Typical symptoms—Typically the patient is in abject misery, suffering from continued abdominal cramps One evacuation succeeds another and as many as 50 to 100 motions Course.

[illegible]

may occur on the lips and in the mouth There is marked tenesmus and the abdomen is sensitive all over and at times the patient may be drenched with sweat After 7 to 10 days the symptoms gradually abate, pyrexia decreases and the patient may become comfortable Though the intestinal symptoms abate, the lesions do not disappear and may last for three weeks in uncomplicated cases This is followed by a post diarrhœal phase of constipation which is nature's attempt to give the bowel rest so as to repair the damage, bowels may not move for three days Most of the cases, however, are not typical as described above Three cardinal symptoms—diarrhœa, abdominal pain and fever are always present in some form or other

Diarrh [illegible] urgent desire to defaecate, faecal
material is [illegible] are accompanied by a sense of
temporary [illegible] more imperative and frequent and
the stools [illegible] is a feeling of incomplete relief
Within a day or two streaks of fluid or clotted blood appear, covering or mixed in the stools, later the stools consist of only small amounts of blood streaked mucus and pus From such material on 3rd or 5th day almost pure cultures of dysentery organisms can be obtained The normal *B coli* flora may entirely disappear at this stage In some
[illegible] oughout the course
[illegible] of acute bacillary
[illegible] Tenesmus is due
[illegible] tly sweet like that
[illegible] gnostic significance
[illegible] egmental casts may
be found

In mild types in infants, stools may be loose, watery and greenish with bile tinged mucus There may be varying degrees of diarrhoea with only one or two motions. Sudden deaths may occur in children with dysentery without diarrhoea Clinical improvement usually occurs with the onset of diarrhœa following on the use of castor oil at the beginning of the disease

The experience of the present writer is in accord with Felsen that marked clinical improvement occurs in the condition of the patient when the diarrhoea starts or after the use of castor oil or salines at the beginning of the disease Very often when the intestinal symptoms are marked the toxæmia is slight and when these are slight the toxaemia is marked

Abdominal pain—Abdominal pain occurs with the onset of diarrhœa or may precede it Pain occurs in form of cramps and is diffuse, though at the start it may occur over the right lower quadrant and may thus simulate appendicitis Some tenderness in the right and left lower quadrants, over thickened and œdematous terminal ileum, sigmoid or rectum, can usually be felt

Pyrexia—There may be no pyrexia or the temperature may go up to 106°F, the peak may be reached early in the course and the onset may occur with a chill In an average patient the temperature may vary between 100° and 103°F and begins to fall rapidly between the 5th and 7th day In mild cases the temperature may not rise, in serious moribund cases absence of pyrexia is of grave significance Disappearance of fever does not coincide with healing of intestinal ulcers

Dysentery in children—Bacillary dysentery (often due to mannite fermenter organisms) occurs in children in a severe form and frequently comes on in epidemics In children nausea and vomiting with diarrhœa are prominent symptoms The stools change from yellow to green in colour contain blood and mucus and frequently develop a very offensive odour Dehydration may become marked and if present should be immediately dealt with Toxaemia may be pronounced, the child may become drowsy or unconscious, convulsions may occur even as a primary symptom

(3) Atypical forms

Appendicular, meningitic and pneumonic forms

In the *appendicular* form the symptoms resemble those of appendicitis there being typical pain tenderness temperature etc, so much so that surgical operation has often been performed In the *meningitic form* severe headache violent emesis convulsions and drowsiness may occur Rigidity of the neck is common, rarely there is photophobia. Lumbar puncture may show fluid under pressure but it is quite clear and the cytology is normal The *pneumonic form occurs in adults in Flexner* infections There may be the usual signs and symptoms with a temperature of 103 to 106°F The cough is transitory and X ray of the lungs may show localized areas of increased density which completely *resolve in 48 hours The clinical impression* is that of lobar pneumonia Within 24 hours the symptoms of dysentery develop

Agranulocytoid type

In the *Agranulocytoid type* the blood picture is that of agranulocytosis and clinical symptoms are severe There is marked progressive neutropoenia the total leucocytes falling to 1 200 per cc with a corresponding decrease of neutrophiles A leucocyte count of 4 000 is of frequent occurrence According to Felsen the destruction of granulocytes may be due to the necrotizing action of the dysentery toxin upon the vascular sinusoids of the bone marrow An asymptomatic type has long been recognised

Asymptomatic type

Asymptomatic type—In *asymptom*
but symptoms are absent In India a
[illegible] state

[illegible] ile secondary contact cases may be severe Sudden
y without intestinal symptoms or lesions but with
oms such as *coryza* catarrhal bronchitis or even
ompany intestinal manifestations

Relationship of specific strains to severity of clinical symptoms—Many authorities consider that there is no constant relationship between clinical severity and the dysentery bacillus strain involved nor are there any specific features indicative of individual bacterial types Certain adaptations on the part of both organism and host appear to occur at *periodic intervals so that a Shiga infection may be gradually replaced by the Flexner type* and this in turn by Sonne Duval dysentery

[illegible] and simultaneously 2 3 or even four biochemically
Clinical symptoms do not differ from the pre
with typhosus and paratyphosus occur In India
dysentery co existing with amœbic infection, the
latter infection not in any way altering the acute course of the former

Chronic dysentery—The infection for reason of severity of original attack or on account of inadequate treatment may become chronic There may be severe anaemia emaciation thickened colon with constant diarrhœa and blood and mucus in the stool Another variety of chronic stage is characterised by looseness of the bowel with presence of mucous and general state of ill health of many years duration The patient carries on his work sometime but has anxiety neurosis his mind being centered on his bowel trouble The abdominal wall is relaxed and there is visceroptosis giving rise to digestive disturbances The writer has encountered a large number of such cases in India and not infrequently vegetative and cystic forms of entamœba are also present Such cases are very difficult to treat and remain invalids till they are carried away by some intercurrent disease

(4) Complications and sequelae

Arthritis

Joint involvement—The average case may run an uncomplicated course Rheumatic like affections of the joints may occur and arthritic complications are frequently seen in some epidemics Usually large joints are involved such as knees ankles elbows wrists sterno clavicular and hip joints Arthritis occurs in the receding phase *i e* in the second or third week of disease There is moderate but persistent fever of 100°F to 102°F, periarticular tissues are swollen and the skin is red and shiny The arthritis is so severe that it may simulate gonorrhoeal infection Tendon sheaths may be involved and sudden effusion into joints may occur, accompanied by chill and sharp rise of temperature to 104°F or so Arthritis may occur in both serum treated and untreated cases and may subside within a few weeks with complete restitution to normal The fluid is usually sterile and suppuration does not occur

Vitamin deficiencies, œdema, ascites—In chronic cases Vitamin deficiency may occur from poor absorption owing to rapid passage of food Signs of pellagra and riboflavin deficiency have been observed Oedema and even ascites may occur owing to myocardial failure The

present writer has frequently seen ascites occurring in India as a post dysenteric phenomenon (due probably to fibrosis occurring in the peritoneum due to irritation by the dysentery toxin) Ascites is not uncommon in chronic dysentery carriers

Urinary tract infections—Infection of the urinary tract is an occasional complication, *B dysenteriae flexner* being the commonest infection but Shiga, Sonne-Duval and *B alkalescens* sometime occur In the former, infection depends on the pH of urine as Flexner organisms do not survive pH of 4 5, they rapidly multiple as the urine approaches alkalinity and disappear with a sustained acidity greater than pH 5 5 This accounts for the effectiveness of mandelic acid ammonium chloride treatment and spontaneous disappearance of the organism Infection of the urinary tract is common with acute and [illegible] Repeated [illegible] mmonium [illegible] ccm daily [illegible] ul Early [illegible] vaginitis [illegible] en rarely described

Other complications.—Parotitis may occur with suppuration and gangrene Perforation is extremely rare but it may occur in the agranulocytoid form and complete healing may follow Conjuctivitis cyclitis and iridocyclitis and iritis may occur Myelitis and hæmorrhagic encephalitis have been encountered Peripheral neuritis is common and chiefly affects the lower limbs Broncho pneumonia, pyelitis pyelophlebitis may occur and intussusception is met with in children.

5. Prognosis

This depends on the resistance of the patient and the virulence of the infecting organisms and on the time when treatment is started With Shiga infections the mortality may be as much as 30 per cent The average mortality rate in bacillary dysentery according to Felsen is 2 to 2 5 per cent In the U S A relapses are common in Shiga infections The clinical course in re infections is like typical acute bacillary dysentery, not frequently relapses may be mild and even symptomless suggesting the possibility of acquired immunity and probably some immunity to heterologous strains When cases of diarrhoea, enteritis and dysentery were studied in *U S A* the majority were bacillary dysentery The death rate in U S A from diarrhoea and enteritis was 17.2 per 100,000 This is comparatively much lower than India where the public health organisation is not as effective Before the introduction of sulphonamides mortality with Shiga infection was as high as 50 per cent

Although infections with the mannite fermenting group are generally mild in children they may assume a virulent form and cause death

6. Diagnosis

Clinical diagnosis is easy in a typical case but accurate diagnosis can only be made by laboratory methods in the early stages by demonstration of an inflammatory cellular exudate and recovery of organism on culture

During epidemics or smaller outbreaks the diagnosis is rarely in doubt The stools are watery and mucoid and may be tinged with blood Laboratory evidence is furnished by the tetrad, positive fæcal culture early in the disease and presence of bacteriophage later, a rising agglutination titer and purulent character of mucosal exudate (Felsen)

[illegible] punctate follicular hyperplasia first and then [illegible] ation during the first three days Sigmoidoscopy [illegible] and should be employed in diagnosis whenever [illegible] is very important and a simple enema should always be given an hour or so before examination Sigmoidoscopic crypt aspiration cultures are carried out with the aid of a glass capilliary tube and a rubber bulb or small suction pump thus supplying material for microscopic and cultural examinations *Crypt aspiration*

From a [illegible] examination [illegible] carriers wh [illegible] appearances [illegible] and haemor [illegible] of necrotic [illegible] coalesce by [illegible]

umbilicated or like a snail track, due to discrete linear areas of mucosal necrosis They are limited *to the large intestines* and ulcers usually show motile trophozoites The best way to examine for *E. histolytica* is on a warm stage from fresh material from sigmoidoscopy The average patient with amœbiasis is ambulatory while *in bacillary dysentery he* is acutely ill The bowel is sensitive to sigmoidoscopy in bacillary dysentery, but not so in amœbiasis.

The following points help in differentiating the two forms —

	Bacillary	*Amœbic*
Onset	Acute	Often gradual and preceded by *initial diarrhœa*
Progress	Severe in the beginning	Tends to be chronic
Stools are often indistinguishable	Contain glairy, mucus pus cells and blood, stool when *formed is coated with mucus*	Mucus pus and fæcal matter mixed Small masses of blood tinged mucus, *stool* when formed is mixed with mucus E. histolyticus
Morbid anatomy	*Sigmoid most affected* Ulceration superficial, mucous membrane thickened Ileum *hyperaemic*	Cæcum and ascending colon mainly affected, ilium rarely, ulcers have undermined edges
Complications	Chronic ulcerative colitis, arthritis iritis	Hepatic abscess

Differential diagnosis is also to be made *from bilharzial dysentery* malarial colitis, tuberculous colon polypi, carcinoma of rectum

Paratyphoid A B & C infections can be distinguished from clinical symptoms

From food poisoning—The salmonella group which gives rise to 'Food poisoning' are *S suipestifer (hog* cholera), *S aertrycke* (mouse typhoid) and *S enteritidis* (Gaertner's bacillus), all are gram negative non-spore bearing motile bacilli whereas *B dysenteriae* are non motile The incubation period in these infections is short (5 to 6 hours) the clinical picture *is due to absorption of toxin* and *rarely bacteraemia may occur*

Staphylococcal food poisoning is due to contamination of foods by food handlers with staphylococcus skin infections The clinical course is generally brief there being fever, vomiting diarrhœa cramps and marked prostration lasting 1 to 3 days The mortality is negligible All these can be readily distinguished

Serological tests

Agglutination

Diagnosis by agglutination test is not possible in the early stages of acute infection as agglutinins do not develop till after the tenth day of the disease Agglutination response *is marked in case of* [illegible] less so in cases of Flexner infections In chronic cases where the org [illegible] ay be useful The agglutination is don [illegible] ulsions of different dysentery organisms [illegible] *1 in 25 to 1 in 250* is put up and incubat [illegible] In Shiga infections agglutination of 1 in 250 is significant and it may be as high as [illegible] 1000 In Flexner infection positive reactions were noted 1 in 25 to 1 in 125 rarely 1 in 250

From the clinical and experimental data accumulated Felsen draws the following conclusions —

1 Agglutinins are not invariably present during or after an attack of dysentery

2 *Normal sera may agglutinate dysentery strains in low dilution*

3 The general absence of dysentery agglutinins in controls and their presence in most cases of acute and chronic dysentery make their detection of considerable diagnostic value

4 The presence of a diagnostic titer does not necessarily indicate active bacillary dysentery (for the patient may have had a previous attack), nor does its absence rule out the disease

5 Like a negative Wassermann test in syphilis and a positive Widal test in a recovered typhoid case *the agglutination titer in* bacillary dysentery must be regarded in the light of the clinical evidence at hand

7. Therapy of Acute Bacillary Dysentery

An average mild case of acute bacillary dysentery generally undergoes spontaneous recovery without any specific treatment Most infants, except those who have the mildest form and adults having the severe type require medical care The treatment may be discussed under the following heads (Felsen)

I Curative and supportive therapy
   (a) Elimination of the causative organism and toxins by catharsis, sulphonamide drugs, bacteriophage, bacterial antagonists, etc
   (b) Specific neutralization of absorbed toxins by anti dysenteric serum, blood of convalscent patients, blood of recovered patients and normal blood
   (c) Diet
II Palliative therapy with drugs
III Prophylaxis with vaccines, serum phage, bacterial antagonists sulphonamide drugs and general epidemiological measures

(1) Curative and supportive therapy

It is important that the treatment should be started as early as possible In mild cases when the diarrhœa is not severe free purgation should be maintained with saline aperients (magnesium sulphate or sodium sulphate) The patient should be put to bed and on an easily assimilated diet rich in proteins and vitamins He should be kept warm and given plenty of fluids by the mouth (one to two ounces every fifteen minutes) As aperients are likely to produce irritation these should not be continued for more than 2 or 3 days and in sufficient quantities to keep the bowels clear An intestinal sedative such as bismuth salicylate 20 grains 3 or 4 times a day may be given if purgation is severe

(a) Catharsis

Diarrhœa is generally nature's attempt to rid itself of the offending organism and the toxins If diarrhœa does not occur, as in some cases of virulent strains, the patient gets toxæmia and death may result The vicious circle of toxin production and re absorption is broken by diarrhœa and the patient improves This is the reason why opiates are absolutely contra-indicated till the intestines are cleared In the mildest cases, diarrhœa may be absent without producing intoxication Carriers and some recovered cases may show virulent strains without systemic symptoms Apart from these exceptions diarrhœa is a compensatory phenomenon A clearing dose of castor oil should, therefore, always be given very early in the disease, and small doses of this may be repeated frequently, as soon as abdominal cramps and diarrhœa appear Some prefer a saline purgative repeated at intervals The present author gives one ounce of castor oil as an initial dose followed by a few doses of (1 to 2 drachms) castor oil emulsion every hour or so till bowels clear and toxæmia relieved An ounce of magnesium sulphate or sodium sulphate may be given followed by a mixture containing one to two drachms per dose of the salt every hour Manson Bahr advises a mixture containing castor oil, half an ounce (15 ccm) and 15 minims of tincture of opium at night before retiring This is useful in cases where there are frequent painful movements of the bowels The use of mineral oil is not recommended as it may coat the mucosa and interfere with elimination of bacteria and toxins from the bowel

Dehydration

The fluid lost by evacuations should be replaced to prevent dehydration I: most cases toxæmia can also be controlled by adequate administration of fluid If bland fluid by the mouth is not sufficient, it should bc supplemented by sub cutaneous or intravenous injections of hypertonic saline or a 10 per cent solutior of glucose *In children the lost fluid should be quickly made good especiall* when vomiting is present, in urgent cases the intraperitoneal route may be used

(b) Sulphonamide drugs

(See also Section on sulphonamide drugs)

Sulphaguanidine, sulphathiazole, sulphadiazine and sulphasuccidine (succinyl sulphathiazole) and sulphanilylbenzamide have been largely used The use of sulphapyridine has been *given up because of its toxic effects So far as the* absorbability is concerned succinylsulphathiazole and sulphanilylbenzamide are absorbed very little from the normal intestine, and therefore high concentrations are *obtained in the gut Sulphathiazole in concentrations of 1 in 10 has* no effect on the dysentery bacilli in vitro but is quite effective clinically Sulphaguanidine, sulphathiazole and sulphadiazine are normally absorbed and more absorption takes place from the ulcerated intestine Concentrations as high as 16 6 mgm per cent in blood have been reported in blood after administration of 27 gm of sulphaguanidine spread over three days Some authorities consider that sulphaguanidine is rapidly absorbed and rapidly excreted from the intestines of man and so does not attain high concentrations Sulphaguanidine is given in doses of 0 1 gm per kilo body weight as an initial dose followed by 0 05 gm every four hours for
every eight hours for two days In inf
doses is given till stools reduce to four in
of 3 5 gm (53 grains) every six hours
every six hours have given good results
zine doses of 1 0 gm (15 grains) every

Sulphaguanidine has been tried in all types of infections, *Flexner 1, 2,* Shiga Kruse, Schmitz and Sonne Duval, and doses up to 100 gm or more have been given in ten days with good results and little or no toxic effects *It is the* drug of choice at present in the treatment of acute bacillary dysentery because of its low toxicity, a total dose of 350 gm has been given without its ill effects Its action is not much influenced by fever and it acts better in acute type of cases In chronic type of cases it is not so effective Sulphanilamide is not suitable for this condition because of its rapid absorbability

Sulphanilylbenzamide is stated to be superior to Pthalylsulphathiazole but both these drugs were superior to sulphaguanidine in all respects particularly
Bose and Ghosh (1945)
l results Treatment was
) For the first two days
4 tablets daily were given,
a cases which recquires a

longer time

Sulphadiazine sulphathiazole and sulphasuccidine

Comparative cultural studies by Harley and co workers with daily administration of sulphaguanidine in doses of 10 gm initial dose followed by 5 gm 3 or 4 times a day and sulphadiazine and sulphathiazole with an initial dose of 4 gm followed by 1 gm 3 4 or 6 times daily showed that Sonne-Duval infect ons were less sensitive to sulphonamides *than* Flexner or Shiga types sulphasucc dine appeared to be better than sulphaguanidine and sulphadiazine better than *sulphasuccidine* Sulphadiazine controlled massive infection with

Sonne Duval infections but was inferior to sulphasuccidine in rendering convalescent and passive carriers bacteriologically negative It showed most rapid bacteriostatic action but bacteriostatic effectiveness does not necessarily imply parallel therapeutic effectiveness Healing does not necessarily occur in the intestinal lesions if the organism is eradicated

(c) Sulphonamides in carriers

Favourable results have been reported from oral administration of succinyl sulphathiazole in the treatment of carriers of bacillary dysentery Daily doses of 0 25 to 1 0 gm per kilo body weight ranging over a period of 2 to 17 days were given, smaller doses, however, are more effective than larger doses

Successful prophylaxis has also been obtained with sulphaguanidine 0 5 gm daily three times a day Although comparatively small doses of succinylsulphathiazole will cure dysentery carriers if treatment is continued for a sufficiently long time, in most cases 0 25 gm per kilo daily in divided doses for a period of from 5 to 7 days are satisfactory The incidence of positive cultures made subsequently after treatment with succinylsulphathiazole gave a carrier rate of 2 6 per cent in a large series

Felsen has summarised the present position of therapeutic effect of sulphonamide drugs in acute bacillary dysentery as follows — *Summary*

1 —Beneficial effects in varying degrees are obtained by the use of both the poorly and readily absorbed sulphonamide drugs

2 —Since bacillary dysentery is a systemic disease with focal intestinal manifestations treatment should be most effective when the absorbable drugs such as sulphadiazine or sulphathiazole are used It is only through the indirect hæmatogenous excretory mechanism that dysentery organisms in deep intramural intestinal crevices, mesenteric lymph nodes or kidneys can be reached

3 —Factors influencing the therapeutic usefulness of any sulphonamide drug in bacillary dysentery include the amount used the day of illness on which chemotherapy is started, the particular dysentery strain involved the presence of inhibiting agents ... l like derivatives) and absorbability ... amounts of a readily absorbed ... our hours, appears to have given ... impairment are contra indications

4 —There is some evidence that the combination of a relatively non absorbable and freely absorbable sulphonamide such as sulphadiazine or sulphathiazole and sulphasuxidine may be more desirable for general use than either type alone

5 —Failures relapses and development of the carrier state following sulphonamide therapy appear to be due chiefly to inadequate dosage (late starting or early

until the symptoms and signs recede and for a minimum of several days after that

It is recommended that since the intestinal lesions persist after disappearance of symptoms and since intermittent excretion of *B dysenteriae* is common in both sulphonamide treated and untreated cases no patient should be discharged as cured until sigmoidoscopy and repeated sigmoidoscopic crypt cultures prove negative

[illegible]

is that many patients erroneously discharged as cured have revealed persistent intestinal

lesions by follow up sigmoidoscopic examinations This may occur even though the i infecting agent (*B dysenteriae*) fails to persist in the majority of cases.

From what has been said above it is clear that sulphonamides are effe drugs in the treatment of bacillary dysentery and their use has consider reduced the mortality rate in this disease The treatment should be started e and must be intensive If this is done the danger of the disease becon chronic is considerably reduced The Flexner infections are particularly an able to sulphonamides while Sonne Duval infections are more resistant drugs in order of their effectiveness are Sulphadiazine, sulphathiazole, sulphap dine, sulphasuccidine and sulphaguanidine

When sulphonamide drugs are being administered large quantities of fl should be given and urine should be kept alkaline This will minimise the of renal complications A copious urinary output should be maintained especi in the tropics The drugs should be continued untill clinical recovery is achie and stools are free from inflammatory exudate

(d) Bacteriophage therapy

Dysentery bacteriophage —The question of specificity of bacteriophage been largely discussed It is established that bacteriophage active against group of bacteria such as *Sh dysenteriae* as a rule has no effect on others (staphylococc) Besides this there are considerable variations within the s

isolated

in the th

ing to some critical investigators and highly promising to others

*The present writer has tried polyvalent dysentery bacteriophage in the tr*ment of bacillary dysentery both acute and chronic forms in a large number cases *in the Hospital of the School of Tropical Medicine*, Calcutta The ca were mostly, of Flexner and Sonne-Duval type, infection with Shiga bacillus be rare only a few cases being encountered during the year In some of the ac cases the results were remarkable and the symptoms subsided within six hours the administration of the bacteriophage and the patient was immensely reliev In the majority of patients the bacteriophage produced little or no effect and any case there was no certainty with regard to the action it is going to produ administration of the phage did not often produce disappearance of the orga from the stools

Experience in the Prisoner of War Camp during the World War II showed t administration of phage highly potent against stock cultures and against strains isol from patients was ineffective in aborting dysentery Dysentery bacilli have been sho to survive four days exposure to bacteriophage in the gut its undoubted potency in vi is therefore deceptive

(e) Bacterial antagonists

"Antagonistic index

It has been asserted that colon bacillus is a normal defence against enteric infectio It has been noted in cases of acute dysentery that there is marked reduction or comple absence of *B coli* According to this view typhoid paratyphoid and dysentery infectio were essentially due to a quantitative deficiency in the normal intestinal flora It has be noted that many strains of *B coli* destroyed or inhibited in vitro the growth of typho bacilli when both were cultured together The ratio of growth of the antagonistic bacter

has been termed the antagonistic index With many *B coli* strains the index was 100 0, no typhoid surviving in a mixed culture This antagonistic property of *B coli* lasted during many months of artificial cultivation *B coli* isolated from dysentery stools are always deficient in antagonistic properties The therapeutic application of this phenomenon has been used, but the possibilities of using *B coli* strains in the prevention and treatment of bacillary dysentery have not been fully tested

(f) Anti-dysentery serum

Anti-toxic effect of serum

The object of this is to neutralize the dysentery bacillus toxins which have [illegible]

dysentery organisms whether it was given simultaneously or within half an hour The serum contains a true specific anti toxin which is most effective when mixed directly with the toxin and less when administered before or after the injection of the toxin Anti dysentery serum has been prepared by injecting horses intravenously with heat killed organism followed by viable organism In this way a serum containing sufficient anti toxin per ccm to neutralize 20 000 lethal doses of toxin for rabbits has been prepared

The standard toxin is prepared by growing good toxin producing smooth cultures of Shiga bacilli on nutrient agar for 48 hours The culture is then washed with water and heated to 56°C for 15 minutes centrifugalized dried in vacuum and powdered. The dried powder is tested for its toxin content The Therapeutic Substances Act lays down that 0 005 ccm of a 1 per cent solution of standard dry (Copenhagen) serum must contain one unit of Shiga Kruse anti serum

An effective anti toxin can only be produced in case of Shiga bacillus and therefore not every case of bacillary dysentery is benefitted by anti toxin Its use is justified only in severe toxic cases and in these it should be administered earliest possible *i e*, before tissue damage is done The dose to be administered should be large enough to neutralise the toxin present the usual adult dose being 5 000 to 10 000 units intramuscularly but preferably intravenously in very severe cases Before administration the serum should be diluted with saline and warmed to body temperature In children veins are difficult to find and in such cases serum may be given by the peritoneal route The dose should be repeated after 12 hours The usual precautions with regard to risk of anaphylactic shock should be taken Such possibility may be excluded by giving 0 2 ccm of 1 in 10 dilution intradermally, if patient is sensitive an erythematous area will appear

The dosage of serum and the route of administration are important factors in determining its effectiveness Anti dysentery serum (20 to 40 ccm) has been given by the subcutaneous route (in flank intra scapular region abdominal wall) [illegible]

the serum becomes manifest within a few hours of administration In children the intraperitoneal route is used It should be remembered that anti serum has no anti bacterial action it combats the toxic effects but does not control the infection

During recent years lyophile (frozen and desiccated) serum or plasma has been used Small concentrates can be used and as much as 25 ccm of twice concentrated human lyophile plasma have been given by Felsen to newborn infants, as much as 50 ccm of ordinary serum have been given in each thigh

(2) Diet in Bacillary Dysentery

Importance of diet

The object of diet is to maintain nutrition and to *protect the damaged bowel* from further injury In the mild type of disease nutrition is not a serious problem but in the severe type with frequent evacuations of bowels it is not possible to take adequate nourishment and make *good loss of electrolytes by* stools Poor absorption of vitamins may also produce serious deficiency symptoms Fluid and salt balance can be readily maintained by parenteral injection of 5 per cent of dextrose in normal saline *Hypoproteinaemia can be dealt with by* use of plasma or whole blood until the food intake is adequate Starvation should be avoided Well masticated and properly prepared solid food has no *deleterious effect when ulceration in the gut is not deep (extending to muscularis)* The tendency, however, is to give too little food of an unpalatable type from unfounded fear of perforation The nutrition is of special importance in infants and in adults with *severe and prolonged type of disease The best thing is to* find a happy mean between starvation and overfeeding food should be whole some containing adequate quantities of proteins carbohydrates and vitamins With tea *especially green tea fluid and tannic acid can be given with advantage* Too frequent feeding is not advisable as it may set up the gastro colic reflex followed by a desire to defaecate with the result that contents of the small *intestine are emptied through the ileo caecal valve Milk is not well borne* and should be omitted in the acute phase

In severe cases in the first 24 hours, only boiled water with or without glucose should be given frequently in small quantities at a time After that thin rice gruel or 'Kanji' may be allowed and plenty of barley and albumin water may be given Some give chicken soup, Brands essence of mutton or chicken and jellies If progress is maintained soft boiled rice with curd (Dahi) well beaten up may be given, arrow root or sago puddings are well borne. Juices extracted from oranges apples, grapes and pomegranate may be given During convalescence return to normal diet should be gradual to prevent a relapse Mouth should be kept clean with alkaline or saline mouth washes

Pectin—Pectin or agar or broth forms the basis of diet used by many clinicians especially in children Raw apple diet has been used probably on account of the action of fruit acids (malic) mechanical cleansing of the mucosa and anti inflammatory effect of tannic acid Pectin which decreases bacterial growth is important constituent of fruit It is also said to adsorb toxins from the intestinal canal and give rise to galacturonic acid an isomer of glucoronic acid which is a chemical detoxicant, malic acid and indigestible cellulose are also useful

pectin 6 3 per cent agar 4 3 per cent
and ... d in a double boiler with 24 ounces
of ... ks on rewarming and shaking and
can ... ller infants 8 ounces of powder are
mix ... juice or chocolate may be added to
it ... e content digestibility and capacity
... said to stimulate normal peristalsis
to precipitate milk in ...
adsorb *bacteria and* their toxins and promote healing In acute bacillary dysentery it is continued till the stools are formed and free from pus and blood

Some clinicians advise withholding of all food to give rest to the bowels It is however known that empty intestines are not necessarily at rest as hunger contraction and diarrhoea due *to starvation are known* to occur

(3) Supplementary vitamin therapy

... *of* bacillary dysentery
... dysentery may occur
espec ... lop when the diet is
in connection wit ...

Vitamin deficiency

lacking in riboflavin and nicotinic acid Association of digestive complaints in man occurs with deficiency of vitamin B complex. Nicotinic acid is said to be essential for the normal gastro intestinal motility Supplementary vitamin therapy includes nicotinic acid amide thiamine chloride riboflavin and B_6 Nicotinic acid amide is given in doses of 1 000 mgm for first day, followed by 500 mgm daily for one week and smaller amounts thereafter, 250 mgm may be given intravenously when necessary 4 to 10 mgm of riboflavin by mouth and 20 to 50 mgm of B_6 intravenously are also recommended When necessary vitamins must be supplied quickly in large amounts and by the parenteral route In acute diarrhoeas in children vitamin C content of plasma and urine tends to remain low even when it is given by mouth in large doses as large amounts are excreted in diarrhoeal stools and absorption from the gut is poor

(4) Palliative drug therapy

(1) Drugs which act locally as adsorbents protective coatings antiseptic or bacteriostatics astringents or for cleansing

Kaolin

These include kaolin bismuth subcarbonate aluminium hydroxide and tannic acid and intestinal irrigations. Drugs coating the surface of mucous membrane interfere with the free drainage of bacteria and toxins which is essential Toxic manifestations may occur after injudicious use of drugs which act as mechanical coating and astringents Some advise kaolin (one teaspoonful) or medicinal charcoal (one teaspoonful) t d s others are against the use of kaolin Colonic irrigations have been used in chronic dysentery or late stages of the acute form

Silver nitrate 0 01 per cent potassium permanganate copper sulphate 1 grain to the ounce of water tannic acid 0 25 per cent methylene blue 0 01 per cent and normal saline have been used Normal saline is probably the best and certainly the least harmful

It may be stated however that intestinal irrigations are not indicated in acute bacillary dysentery and injections do not often reach the small intestines

(2) Of drugs acting on the central or peripheral nervous system crude opium is best but it should be used sparingly in cases with severe intestinal spasm abdominal cramps tenesmus and severe diarrhoea The best preparation is tincture of opium which in 10 to 15 minim doses three times a day gives relief Crude opium is preferable to morphine Papaverine hydrochloride one grain (65 mgm) combined with ¼ grain (16 mgm) of belladonna extract are useful Dilaudid hydrochloride ⅓ gr (2 3 mgm) orally or 1/20 gr (3 2 mgm) subcutaneously morphine sulphate ¼ gr (16 mgm) or pantopan ⅓ gr (22 mgm) may be used sparingly if indications exist Opiates should however only be used in cases of extreme urgency as they may produce serious results by inducing constipation

Dehydration acidosis

(3) *Replacement therapy*—Dehydration occurs rapidly especially in hot climates and is serious in children A large fluid intake should be maintained so as to insure a daily output of urine in excess of 1500 ccm in adults In severe cases fluids are given parenterally *e g*, 5 per cent dextrose in normal saline or Ringer's solution by continuous slow drip method 15 to 30 drops a minute care being taken to pr[illegible] Others recommend

[illegible] children give

[illegible] One gramme

[illegible] per cent For

a child weighing 10 kilo body weight with a CO_2 combining power of 15 volumes

per cent 260 ccm of a 5 per cent sodium bicarbonate solution would be necessary It has been said that in the presence of guanidine like substances in children with gastro enteritis blood calcium is lowered leading to convulsions Five to ten ccm of calcium gluconate intramuscularly or intravenously have been given Warm applications to abdomen in form of hot water bottle are comforting

8 Prophylaxis

There is no evidence to show that there is natural immunity against bacillary dysentery but there is convincing evidence that immunity can be acquired after an acute attack Immunity is of a *highly specific type but the duration* and degree of protection are not known The general physical state has no influence on either the susceptibility or outcome of the disease but infants and young children are particularly susceptible

Re infections are rare (4 in 10000 patients) and recovered patients show marked resistence to subsequent attacks Persistent agglutinins have been noted in sera of patients recovered from an attack which suggests but does not necessarily indicate immunity New arrivals in endemic areas are more susceptible than residents European children generally get a severer type of disease than native children The consensus of opinion is that an attack gives rise to lasting immunity against re infection by the same strain but not to related though anti genically different strains

The type specificity of immunity is of primary importance in prophylactic vaccination of this disease Successful immunization by vaccines by the sub cutaneous route has been carried out by a large number of workers and successful immunization by oral use of vaccines by Besredka A contrary opinion is held by other workers

Prophylactic value of anti dysenteric serum has also been demonstrated in animals Immune rabbit sera protected mice against ten lethal doses of *B dysenteriae* when serum was given before or together with the organism If serum injection followed the fatal dose no protection was observed

General methods of prophylaxis

Methods of prophylaxis other than vaccination for prevention of bacillary dysentery are serum bacteriophage bacterial antagonists sulphonamide drugs and general epidemiological measures In epidemics use of monovalent type of human serum from convalescent patients is valuable and is better than polyvalent horse serum Less serum is required to prevent dysentery than to cure it the prophylactic dose being half the therapeutic dose

The prophylactic value of bacteriophage has not yet been determined and the same is true of sulphonamide drugs of which sulphasuccidine and sulphaguani dine are most promising Individual sensitivity to these drugs should however be borne in mind The bacterial antagonists such as certain strains of *B coli* hold considerable promise and appear to be free from untoward effects

Hygienic and sanitary measures are most important from point of view of prevention Particular precautions should be taken with regard to isolation of patients and sterilization of bedding clothing etc The stool should be disinfected and food should be protected from flies If safe water supply is not available drinking water should be boiled Under field conditions water may

be chlorinated or a drop of 7 5 per cent tincture of iodine may be added to a quart of water to kill the dysentery organisms present For briei period, in highly endemic areas or during epidemics 0 5 gm (7½ grains) of sulphadiazire may be taken every twelve hours

Fly control

and warmth of spring Flies must then feed for week before they can lay their first eggs in damp and decaying matter Larvae or magots hatch out in a few hours in warm weather to become pupae in about five days and the adult insect takes five more days to develop An egg laying fly can lay in the course of six months more than 131 quintillions of descendants if all eggs mature. It has also been estimated that one fly after feeding on sputum or on manure, can carry 500 to 600 million bacteria on its body Ants have been found to be potential carriers of flexner bacilli and bacteria can be recovered 24 hours after the ant has gone through infected material

II. CHRONIC BACILLARY DYSENTERY

Introductory —Though acute bacillary dysentery presents a clear cut clinical picture, chronic bacillary dysentery does not On account of the uncertain state of our knowledge it has been given a number of names such as "asylum dysentery" 'idiopathic ulcerative colitis," "simple ulcerative colitis", 'ulcerative colitis', etc

It has long been observed that in the insane asylums dysentery becomes persistent probably due to the presence of carriers who had never completely recovered from the initial acute attack and who suffer from repeated acute exacerbations of bacillary dysentery These individuals excrete the same or different dysentery strains and sometime it is difficult to decide whether these are re infections or relapses

1. Colitis

The inflammation of colon is termed colitis but the term is often
for mar
mild irr
cells wh
mechani
expulsic
mucus in both cases takes place in order to protect the mucous membrane from damage All irritating drugs whether given by the mouth or in form of enemata produce stools

colon and secondly when there is colitis mucus is always present

Acute catarrhal colitis occurs in varying degrees of severity The milder forms at one end may be described as simple diarrhoea and
may resemble acute stages of ulcerative
and dysentery depends on the reaction of
into dysentery In simple diarrhoea there
In dysentery there is characteristic inflam

blood cells, polymorphonuclear leucocytes and macrophages (mononuclear phagocytes) Chronic catarrhal colitis is the result of recurring attacks of the acute form and may be of various grades of severity Sudden and severe exacerbations may frequently occur in this condition. When these have gone on for sometime inflammation may proceed to the stage of ulceration and ulcerative colitis may be the result. In acute bacillary dysentery and acute colitis death may occur in a few days the pathological changes being marked ... ie mucous membrane If however the patient survives ... Ulcerative colitis therefore follows catarrhal colitis ... may follow acute bacillary dysentery or other such conditions

2. Chronic Bacillary Dysentery

Following acute bacillary dysentery

A patient with acute bacillary dysentery *generally recovers completely in* about three ... well intestinal ulceration (as seen w... of cases however the patient is cl... is not entirely well He occasionally gets fluid motions with abdominal pain, usually not severe enough to go to bed He may even run a slight temperature Inspite of ordinary treatment attacks increase in severity and frequency and in six months or longer he may get a profuse intestinal haemorrhage or increased amounts of mucus and pus in the stools The diagnosis of mucous colitis or spastic colitis is *wrongly made* A *sigmoidoscopic examination at this stage will show intestinal* ulceration as in acute bacillary dysentery which has not healed At this stage *B dysenteriae* may have disappeared or may persist Felsen obtained evidence that approximately 10 per cent of cases of bacillary dysentery (Flexner) if followed up for a year or so develop chronic distal ileitis or ulcerative colitis at the end of this period These cases clearly show that the original acute attack though it subsided has never cleared up completely

Secondary infection with B coli

The secondary infection of ulcers with *B coli* (hæmolytic and non hæmolytic) and enterococcus occurs on the original *B dysenteriae* ulcers and the infection is persistent and difficult to eradicate Any part of small or large intestines may be affected often in a segmental fashion but there is a definite predilection for the distal portion of the ileum and colon Familial and conjugal association may play a part Chronic ulcerative colitis and chronic bacillary dysentery would thus appear to have a common aetiology according ... type of metadysentery' has been described by

Hill diarrhoea

difficulty of isolating dysentery organism after ... is well known *The non isolation of organisms* in chronic forms of the disease can, therefore be readily understood

3 Chronic Ulcerative Colitis

Introductory—The problem of *ulcerative colitis remains unsolved* The consensus of medical opinion is inclined to regard it in the same light as pulmonary *tuberculosis* the disease can only be arrested by prolonged treatment involving rest in bed and maintenance of mental peace prolonged general measures etc. Spontaneous intermissions are common and need careful treatment Intercurrent infections and emotional disturbances have a deleterious effect on the progress of the disease

Chronic ulcerative colitis as met with in India may be defined as a disease of the large intestines during the third and fourth decades of life with characteristic and pathological features but without any specific bacteriological

infection The effects of allergy, avitaminosis, faulty body mechanics and emotional disturbances have yet to be precisely determined The view that like peptic ulcer, it may be a local manifestation of a general condition has been put forward

(1) Aetiology

In ordinary cases of chronic ulcerative colitis there is very often a history of acute illness resembling acute dysentery Spontaneous recovery may occur and relapses may follow the condition finally passing on to chronic ulcerative colitis Dysentery organism may or may not be isolated but all the recent evidence points to the fact that ulcerative colitis is a form of chronic bacillary dysentery Secondary infection often occurs with *B coli* and enterococcus these organisms gain entrance through the denuded intestinal mucosa advance along the lymphatics and are persistent and difficult to eradicate Besides these streptococci derived from throat as a result of tonsillitis or organisms of salmonella group may be found in the ulcers

Sudden spontaneous remissions in chronic ulcerative colitis are probably due to an increase in the immunity defence mechanism as shown by increase of agglutination and bactericidal titres of the blood of the patient During recurrence of symptoms the defence mechanism is lowered the disease would thus appear to be of a cyclic nature

Serum agglutination in chronic ulcerative colitis is of little diagnostic value A high titer against *B dysenteriae* may be due to a previous dysenteric infection which has no relation to the chronic disease In chronic ulcerative colitis the agglutination titer may go up from 1 100 to 1 640

Other views—A lancet shaped diplococcus *Str mitis B morgani, Bact necrophorm* have all been associated with the causation. Protozoa occur when the condition follows amoebiasis The fungus geotricham and *Monilia albicans* have also been found in some cases A virus isolated from the intestines has been incriminated Allergy emotional disturbances faulty body mechanics and deficiency of vitamin C and the B complex factors have been suggested as aetiological factors The general opinion however is that vitamin deficiency is secondary and not a primary phenomenon. Intestinal parasites which are so common in tropical climate have been blamed for more than one symptom Irregularity of hours unsuitable dietary addiction to drugs and smoking also enteritis following typhoid and other exanthematous conditions have all been regarded as possible exciting causes It is likely that many factors produce devitalization of mucous membrane of the large intestine leading to chronic ulceration

According to Felsen the concept of common pathogensis of bacillary dysentery distal ileitis and chronic ulcerative colitis has received corroborative support from many sources Both distal ileitis and ulcerative colitis occur frequently during the initial acute stage of bacillary dysentery The criterion of positive dysentery culture in all cases is inconstant in view of the facts that in chronic bacillary dysentery positive cultures are the exception rather than the rule.

(2) Pathology

The chronic stage of bacillary dysentery blends imperceptibly with the non specific stage so called because the original infection can no longer be traced in the lesions and secondary infection with *B coli* and enterococcus has taken place The denuded areas extend in all directions become confluent and extensive serpiginous or geographic mucosal denudations occur The small remaining islands of intact epithelium are often pinched off and swollen with accumulated secretion oedema and cellular infiltration so that they look like pseudopolyps The secondary infection penetrates deeply into the wall through lymphatics and abscesses may form and may even break through into the peritoneal cavity General peritonitis however does not usually occur as the area becomes well walled off on account of the slowness of the process of extension Small sub-mucosal abscesses may break through into the lumen of the gut the purulent material being passed out in the stools The formation of intramural abscesses is accompanied by marked daily rises and remissions of temperature of a septic type which disappear when the abscess breaks into the lumen of the bowel Most of these cases go on for years and eventually fibrosis of the wall and its thickening is the result. The lymph nodules disappear

Pseudopolyps

Sub mucosal abscesses

does not occur Adenomatosis coli is neoplastic, miliary and of the nature of tumour on the mucosa. Stenosis if present is local and malignancy may occur There is no loss of haustration in true polyposis Carcinoma of pelvic colon and rectum is often mistaken for ulcerative colitis, but digital examination of rectum and sigmoidoscopy soon clear it

(5) Prognosis

Relapses

If adequate treatment is given in a proper institution from the beginning a large majority of patients should completely recover and return to normal life This is however not always possible in a country like India and the patients gradually get worse and die There is great tendency to relapses but if every relapse is treated properly with complete rest in bed and other measures from the very beginning until sigmoidoscopic examination shows that all active disease has disappeared the relapses become milder and milder and less frequent and finally cease Recurrences tend to occur with acute infections *e g*, food poisoning tonsillitis dietary indiscretions exposure to cold and damp fatigue etc Mortality is low not more than 5 to 10 per cent

At best, the prognosis is if anything better than in the past In about 50 per cent of cases definite improvement takes place but the treatment must be prolonged and laborious It is yet too early to say if recurrence can be prevented

In the more chronic cases even if the ulcers are healed, proneness to diarrhœa and mucous discharge tends to persist owing to gross damage to an extensive area of the large intestine and consequent impairment of its physiological function of absorption of fluid Some peristaltic disturbance persists also owing either to the mechanical cause of widespread fibrosis or impairment of the neuromuscular mechanism

(6) Treatment

There is no specific for this condition, the treatment is generally protracted and somewhat onerous Great perseverance is required both on the part of the patient doctor and the nurse, as weeks or months of strict treatment, dietary, general and medicinal, is necessary even in early cases The patient may have to be in bed for six months or a year As long as fever is present the patient should be confined to bed Diet should be liberal and easily digestible rich in proteins and vitamins

(a) General and medical treatment.

The time of strenuous treatment is at the early stages before the colon is converted into a physiologically inefficient organ owing to fibrosis and stenosis

(i) *Rest in bed*—This is very important for maintenance of strength and control of fever Exercise or activity usually increases the tenesmus and frequency of motions In the more serious cases frequency of motions is distressingly increased even by the erect posture alone Appreciable relief is quickly obtained by beginning the treatment in the recumbent position In this position the force of gravity, which increases the sag of the organs and the strain on the body as a whole when in the upright posture is practically eliminated For this purpose both the hyperextension position' with dorsal decubitus and pillows under the knees and 'the face prone' position are recommended

(ii) *Mental tranquility*—The restoration of mental peace after serious emotional disturbance is not easily achieved In these cases it may be necessary to administer sedatives Elimination of mental worries tends to rapid improvement in one group of cases which may be called the neurasthenic type Vitamin B complex is usually beneficial in this type of case Psychotherapy may be needed in a serious case of nervous breakdown and severe mental depression

(iii) *Diet*—By general consensus of opinion a low residue diet is best, but it is important to remember two fundamental desiderata Firstly, the diet

should be made up of adequate calories for maintenance of good health and body-weight, and secondly, it must be rich in vitamins Many patients go down hill because the diet is too restricted and monotonous In a case of moderate severity it is best to begin with a modified Sippy treatment with addition of Benger's food and suitable extractives A more generous diet may be quickly allowed provided there is no bleeding or abdominal cramps

(iv) *Administration of vitamins*—There is reason to believe that avitaminosis is an important factor in the aetiology of this disease (i) Ascorbic acid (vitamin C) has an excellent styptic effect in haemorrhages of ulcerative colitis It is given either intravenously or intramuscularly in daily doses of 150 mgm, until there is only one motion free from blood and pus In less urgent cases the drug may be given orally in usual doses three times daily (ii) *Vitamin B* complex It is as yet difficult to indicate the precise effect of vitamin B complex on ulcerative colitis In the form of 'marmite' or other such preparations it has been found to be a valuable adjunct in the treatment of this disease (iii) *Vitamin A and D* may be given in concentrated form Cod liver oil by mouth is beneficial and the author has had gratifying results from rectal instillations *Vitamins*

(v) *Allergy*—There is little doubt that in a number of cases a definite history of allergy is obtained but it is not possible to state at present whether the allergy is due to a particular protein or some unknown amino acids as the result of incomplete digestion In this group Torantil' (Bayer) is worthy of trial as very gratifying results are not infrequently obtained One ampoule of '*Torantil* is injected intramuscularly twice a week one course comprises five injections This is followed by a course of oral treatment consisting of one pellet before each principal meal for one week The patient should be watched carefully as in some cases which are impossible to predict, the symptoms may be definitely aggravated In one case after the ingestion of two pellets serious bleeding was definitely stopped

(vi) *Vaccines and sera*—Bargen (1935) and Buie (1937) report excellent results with autovaccines and specially prepared sera Anti streptococcal sera proved useless Auto vaccines in a few cases have been beneficial affording some amelioration of symptoms

(vii) *Drugs*—There are no specific drugs, sulphonamides are of little value in our experience A few drugs are used for purposes of symptomatic treatment —

Buffered citrate therapy—Success has been claimed with this method of treatment and it is ascribed to an improvement of acid base balance of blood lessened tendency to alimentary capillary stasis and venous thrombosis and improved tissue resistance to general infection Schultz's solution is used for intravenous injection It consists of a combination of sodium citrate and sodium chloride buffered with a salt which raises the concentration of the solution somewhat higher than that of normal blood The initial dose consists of 10 ccm This is doubled after 24 hours and continued on alternate days

Lactose—It is probably not quite correct to include lactose among the drugs but it is particularly valuable in cases where flatulence and intestinal fermentation are troublesome and it may be used in place of sugar and glucose In chronic constipation it is useful as a mild laxative Two to three tea spoonful may be given in a tumbler of water in the morning

eneral therapy
nd drugs

Plantago ovata—It is known in the vernacular as 'ispaghula' or 'isabgul' and is a well known and popular remedy in chronic dysentery on account of its emollient and demulcent effect The seeds are thoroughly cleaned free from sand and grit with which they are mixed or the separated pericarp of the seed may be used One to four heaped dessertspoonfuls are mixed with a little sugar and shaken up in a cupful of water and the mixture is then swallowed twice daily The drug has no bactericidal action and its effect appears to be entirely mechanical The seed after ingestion become uniformly mixed with the intestinal contents so that they are spread uniformly over the entire surface of the mucous membrane The irritated or ulcerated areas of the intestinal mucosa are soothed by the demulcent action of the mucilage, which is not acted upon by the intestinal juices It thus covers the surface of these ulcers protecting them from further irritation The drug is tasteless and in chronic constipation it produces a laxative action similar to that of agar (Chopra, 1936)

Opiates—In spite of the introduction of numerous substitution products it is doubtful if the action of opium can ever be excelled by any other drug for the induction of sleep, control of diarrhoea and increased frequency of motions, and the relief of abdominal pain Tincture of opium in five to ten minim doses is available for prompt relief Compound tincture of camphor, in one drachm doses is also useful It is important, however, to discontinue the drug as soon as the desired therapeutic effects have been obtained

Calcium and parathyroid—Prolonged administration of calcium lactate (15 grains) and parathyroid extract (1/20 grain) appears to be beneficial in a number of cases

Maintenance of water balance—In cases of diarrhoea and vomiting it is imperative to maintain an adequate water balance, and for this purpose, when necessary, solutions of glucose (25 ccm of 25 per cent solution) should be administered intravenously and normal saline solution subcutaneously

Transfusion of blood—A high degree of anæmia is not infrequent in ulcerative colitis and is due to continuous loss of small quantities of blood in the fæces In these cases a small transfusion (200 ccm) twice weekly for three or four weeks may be carried out with benefit On rare occasions transfusion of blood may be necessary as a life saving measure With neohaemoplastin (Parke, Davis and Co) excellent results are generally obtained, but failures are not infrequent whereas repeated transfusions of blood may be successful In massive haemorrhage morphine is indispensable as in duodenal hæmorrhage

od liver oil
nemata

Medicated enemata—Since the disease affects all the coats of the large gut, the use of medicated enemata may be rightly regarded as illogical Stronger antiseptics cannot possibly reach the deep-seated diseased areas and on the contrary, may aggravate the patient s condition by further devitalizing the superficial ulcers and lead to delay in healing Nothing can supersede a normal saline enema in these cases Local instillation of cod liver oil has been found to be beneficial It was first tried by us empirically, as we were impressed with its encouraging results in some intractable ulcers of the skin At first half an ounce of cod liver oil was injected at night slowly with a rubber catheter, but in the majority of cases it was promptly rejected In about a week's time retention of the oil was found to be fairly satisfactory A better method consists of giving a 40 per cent emulsion of cod liver oil with gum acacia The emulsion is instilled two to four times a day in doses of two to four ounces with a gradual increase up to eight ounces Marked improvement is not usually noticed before three months A 60 per cent suppository of cod liver oil may also be used

4. Chronic Distal Ileitis (Regional ileitis or enteritis)

The increasing incidence of this disease is due to the increasing incidence of bacillary dysentery The distal ileum and caecum and in some cases the jejunum and ascending colon are usually involved The incidence is equally distribute in both sexes

Symptomatology

The onset is insidious and in many cases traced to an initial attack of bacillary dysentery Recurring attacks of abdominal pain, diarrhoea and fever, increase, following the same course as in chronic ulcerative colitis, until the colon is involved in a considerable number of cases The abdominal pain may be diffuse or localised to right lower quadrant of abdomen and may be colicky or a dull ache Such toxic manifestations as nausea, vomiting, anorexia and loss of weight and deficiency states set in Fistulous tracks may form and open into the bladder, vagina or adjacent loops of lower bowel Mesentery and regional lymphatic nodes may be involved and there may be abscess formation During an exacerbation, a tender mass may be felt in the lower quadrant As the disease progresses anaemia and marked emaciation may occur and the patient may exhibit the 'Mendicants Posture" The stools are watery, bloody, mucoid or purulent and health rapidly deteriorates Spontaneous resolution may occur with conservative treatment X rays show the 'string sign' (a thin slightly irregular line or shadow suggesting a string of cotton) in the affected region (up to the ileocaecal valve), but the diagnosis does not rest on this entirely

The diagnosis is not always easy X ray evidence may be absent, but positive clinical evidence should be looked for In the majority of cases the ileal lesion can be demonstrated by a barium enema due to the reflex filling of the terminal portion of ileum through the ileocaecal valve Thick barium meal may produce obstruction due to narrowing of the lumen

The same complications as in case of chronic ulcerative colitis may occur, *e g*, fistulae, anaemia, arthritis, deficiency states, etc Acute distal ileitis is a manifestation of acute bacillary dysentery and the pathological lesions are the same as the latter which may involve any part of large or small intestine The narrowing of lumen and shortening is due to fibrosis of the wall There is evidence of a familial incidence

Treatment—The same line is followed as in case of chronic ulcerative colitis Surgical removal has been undertaken but the results are often unsatisfactory Most cases of acute ileitis and some of chronic ileitis heal spontaneously Resection should, therefore, be undertaken after careful consideration

5. Hill Diarrhoea

[illegible]

to its infectious nature

Aetiology—With regard to the exact nature of the disease little is known. It seems probably that hill diarrhoea is more than an intestinal catarrh and covers a number of bowel disorders It was at one time supposed that the food and water supply was responsible for the occurrence of the disease The theory of mica contaminated water as the causative

agent can not be substantiated, as it has been definitely proved that in an epidemic a no trace of mica or other solid particles can be found on centrifuging the water collec during the rainy season when the incidence of the disease is at its height.

Many authorities do not consider it to be a separate disease from sprue, hill diarrho stools of the patients in nearly ndigest food particles The stools are of the proper pumping action Fail according to some the cause of cold where the symptoms persist and develop ultimately the clinical picture of sprue. met w

Influence of climate

The influence of climate in precipitating an attack of diarrhoea in the hills in epidemic form, has been recognized. In India it has been shown that a sudden chan of temperature is very liable to bring on an attack of this nature in the hills It h therefore been held that the disease is due to sudden changes in the physical environme

from the hills digestive function, lowered resistance due to long residence in the tropics, rapid changes temperature in a moist atmosphere with low barometric pressure also play some part precipitating an attack.

In addition to the prevalent views regarding the aetiology, the question of infection b a specific organism should be considered. In the hospital for Tropical Diseases Calcutt of hill diarrhoea. On bacteriological examin cases Vaccin sub nism ma be fresh infections from infected wat whic have remained dormant in the plains climat of the hills

Clinical aspects—Soon after the patient goes to a hill station, he starts a water diarrhoea passing several stools in the course of the day This is accompanied by marke flatulent dyspepsia, mild constitutional symptoms, such as lassitude, loss of appetite etc. but the patient does not feel particularly ill and able to go about. He however, feel unwell and cannot do his ordinary work or undergo physical exertion The stools or microscopic examination usually show cellular exudate as in mild bacillary dysenter but no blood. If the condition is allowed to go on to Hill diarrhoea the stools become very similar to those occuring in sprue (increased fat and deficiency of bile) There i usually a large fluid, frothy stool with fat first thing in the morning and there may be one or two more stools by mid day but afterward there are no more stools till the next day

Treatment—Rest in bed and proper dieting are important Cases due to hill climate entirely respond very well to elimination of fat from the diet Napier (1945) recommends calomel in divided doses of ½ grain half hourly till 1½ grain are given, and bile in form of keratin coated pill, grain 10 three times a day for several days The old treatment for this condition was to give one drachm of liquor hydrargyri perchloridi, three times a day followed by ten grains of pepsin two hours later

In the later stages when the stools have assumed a sprue-like character, the treatment is given on the same lines as sprue

6. Chronic Gastro-Intestinal Disturbance in India

and General

tion. The majority of the patien

past from chronic dysentery, either bacterial or protozoal in origin, and show diverse and often vague symptoms such as indefinite pains in the abdominal region, indigestion, flatulence, irregularity of the bowels, (diarrhœa or constipation) etc In a number of them non lactose fermenting organisms are detected, in others cysts of *E histolytica*, Charcot—Leyden crystals, flagellates such as *Giardia intestinalis* or *Trichomonas hominis* are found, in others helminthic parasites are discovered in the stools Although it is natural at first to attribute the patients' symptoms to the particular infection found, it has been often observed that symptoms in many do not abate inspite of the eradication of such infections The disturbances in these patients are, therefore, often put down as functional in nature or a vague term such as 'chronic dyspepsia' is used in their diagnosis

On going into the history of these patients it will be found that they are chronic sufferers who have been treating themselves with 'stomach powders', liver pills', 'salts, and have even received courses of emetine from their medical attendants, but with little or no permanent relief or benefit The trouble goes on for years and some of them are described by their medical attendants as suffering from neurasthenia, a term used to cloak our ignorance in the tropics as often as anywhere else. The present author believes that there is no such condition as neurasthenia without a definite organic lesion of some kind which is the source of irritation in some part of the body The intensity of symptoms produced varies with the degree of sensitiveness of the individual to the irritative stimuli from this source The symptoms thus produced are reflex in origin and the sufferings of the individual may sometime be severe, but frequently there may be periods of intermission, when the patient feels comparatively well and may even think he is cured.

A careful clinical examination of these patients shows that the classical textbook signs and symptoms of a definite gastro intestinal lesion are as a rule, absent Some of them have been shown to have definite surgical lesions which are likely to be overlooked in ordinary examination Such patients are seldom thoroughly enough investigated for a proper diagnosis to be aimed at even in ordinary hospitals to say nothing of the private practitioners, as laboratory facilities for such detailed investigation are often not available. These patients therefore, go on suffering for years till anæmia, emaciation or other complications and sequelae supervene and they are carried away Besides detailed and thorough bacteriological and protozoological investigations, examination by x rays after an opaque meal is essential in many of these cases to locate the lesion

(2) Clinical aspects

The symptoms are mostly of a subjective nature and they might be classified under three main heads namely abdominal pain and tenderness gastric symptoms and intestinal symptoms. *Symptomatology*

Abdominal pain—Most of the patients complain of pain of varying degree of intensity in some part of the abdomen *It may only be a sensation of uneasiness or discomfort.* A large number complain of pain in the epigastrium or in the caecal region or in the region of hepatic or splenic flexure. There may be griping and tenesmus such as occurs in acute dysentery On palpation tenderness and rigidity of muscles may sometime be elicited in the region of the caecum and ascending colon or on the left side of the abdomen or in the epigastrium The large bowel may be palpable and show thickening

Gastric symptoms—These consist chiefly of a feeling of heaviness after meals heartburn, acid eructations, loss of appetite nausea and occasional vomiting These are constant symptoms in many of the patients. There may be definite tenderness.

Intestinal symptoms—*Irregularity of the bowels is* one of the main symptoms for which the patients seek advice In the morning the patient may pass 2 or 3 small motions *Constipation* diarrhoea and const ... nt. A large proportion of patients may pa ... s. *Flatulent* distension after meals is a com ... the patient getting blown up and the heart

The patients look pale, anaemic and emaciated and have a worried look The liver may be enlarged

(3) Radiological findings

Opaque meal and enema show the following —

Opaque meal In one group of cases irregularity o ... for a spasm and filling defects are frequently seen and ... were found several hours after the sto ... and catarrh was often seen Some of ... showed signs of active or healed ulcer ... of the duodenum or lower down

A condition which was *not infrequently met with in these patients is the hurrying* of the meal through the small intestines In 2 to 3 hours the meal passes through the *small gut, and reached the hepatic or the splenic flexure*

In another group of cases the appendix is visualized for long periods that is up to 72 hours after the meal sluggish appendix It is sometimes abnormally long is distended had constrictions in it may show the presence of concretions and is often adherent to the caecum *Such cases may undoubtedly be classed as pathological appendix* The caecum is frequently mobile and shows signs of ulceration or catarrhal condition which some times may extend *all* the way down to the pelvic colon *Thickening and spasm of the colon* are frequently seen.

In the third group abnormal delay in emptying distension of the caecum and the colon often with n ... of the contents and catarrh are the *main featu* ... 48 hours or longer These

In the fourth group loss of muscular tone of the wall of the whole of the gastro intestinal tract *is seen and there is abnormal retention of contents* In some visceroptosis is marked the stomach the small intestines and the trasverse colon all appear to be lying in the pelvis

In the fifth group there are *definite signs of inflammation or ulceration in some part* of colon accompanied by excessive gas formation In others there is abnormal irritability of the large gut and residual strings or streaks of barium are visible.

Classified according to what was considered to be the main radiological diagnosis *the* patients can be grouped as follows —

Duodenal ulcer and duodenitis pathological appendix stasis of the intestine atony of the gastro intestinal tract ptosis catarrh and colitis

The patients rarely suffer from any one of these conditions singly, a combination of these being the rule.

(4) Laboratory findings

A detailed microscopical and *cultural examination of the stools was done in all cases* in this series A number of patients had hookworm infection *E histolytica* was found in the stools in many

The bacterial organisms of doubtful pathogenicity, which were *found in the stools by* culture are given below —

1 Non lactose fermenters —

Bact pseudo carolinus Bact alkaligenes, Bact morgani Ps pyocyanea Bact asiaticum Bact para asiaticum Bact pseudo asiaticum, Bact lunavensis Bact metalkaligenses, Bact douglasi, Bact paratyphosum Bact pritnitzi

2 *Late lactose fermenters—*
Bact belfastiensis Bact metadysentericum

3 *Others—*
Str faecalis Staphylococci monilia

Briefly the cases who came for chronic gastro-intestinal trouble many originally had dysentery which was later complicated with other pathological conditions of the bowels Symptoms were variable the chief being abdominal pains distressing flatulence and irregularity of the bowels which had lasted for prolonged periods and which were not controlled by ordinary methods of treatment This is the class of case which comes under the category

examination

It was observed that in patients in whom the appendix still retained the barium meal after 24 hours the organ was not normal In those in which the meal was still retained after 48 hours the appendix was definitely pathological and many of these cases showed constrictions and concretions These observations were confirmed in a number of patients after operation

(5) Treatment

The treatment of this group of patients is unsatisfactory as many of them have definite pathological changes in some part of the gastro intestinal tract If these can be eradicated as in case of gastric or duodenal ulcers or pathological appendix the patients improve In other cases where pathological changes are advanced as in case of chronic inflammatory conditions in the colon such as chronic ulcerative colitis the patients go on suffering In patients with atony of gut visceroptosis and stasis considerable relief is obtained by regular use of enemata and aperients and proper abdominal exercises to build up the tone of abdominal muscle and gastro intestinal tract which has been lost Proper dieting is essential

III ENTERIC FEVERS

The enteric group of fevers includes typhoid fever due to infection with *Eberthella typhosa* and the paratyphoid fevers A B and C due to *Salmonella paratyphoid* A B and C respectively

Introductory

The generic name enteric fever is also a convenient name as it is often impossible to distinguish these fevers clinically Generally infections due to the paratyphoid group of organism are milder and less fatal than typhoid fever but it has been shown that some of the fevers due to the so-called paratyphoid

distribution of the different types it may be said that these fevers have a world wide distribution Paratyphoid A fever occurs more commonly in India and the Far East paratyphoid B is more prevalent in temperate climates *e g* Europe The more the attention of workers is directed to the study of these fevers the more it is being realized that a number of organisms more or less related to one another are implicated in the causation of these fevers and that they have a much larger area of distribution than was formerly believed

The enteric group of fevers occur throughout the year in the tropics and during the hot and moist periods of the year they tend to occur in epidemic form Wherever sanitation is deficient and there is neglect of proper disposal of faeces, and wherever there is a lack of safeguarding of the water supply,

Hypostatic congestion of the lungs is nearly always present and a form of pneumonia may occur due to localization of typhoid bacillus in the lungs Death in some cases is caused by a lobar pneumonia in which abscess formation or gangrene are common complications Pneumococci in the majority of cases accompanied by typhoid bacilli in some are the organisms usually obtained on culture

The blood shows leucopenia though in the first few days there may be mild leucocytosis with relative increase in lymphocytes especially the large mononuclears

Subperiosteal suppuration not uncommonly occurs and the tibia ribs clavicle femur, ulna and humerus are the bones most commonly involved Changes similar to those occurring in lymphoid tissues occur in the bone marrow

(2) Clinical features

Five cardinal symptoms are characteristic of typhoid fever—(1) Fever with a step like rise which is remittent and ends in lysis, (2) slow dicrotic pulse, (3) rose spots usually on the abdomen (4) enlargement of spleen, (5) toxic appearance of patient.

Fever

The fever generally starts insidiously with lassitude frontal headache, nausea, loss of appetite chilliness pain in the legs and increasing muscular weakness The patient is restless and sleep is generally disturbed Some degree of bronchial catarrh is common and bleeding from the nose occurs in 25 per cent of cases The fever usually rises by regular step ladder gradations and after attaining its maximum remains so for sometime it then begins to remit in the morning finally ends in lysis This behaviour of temperature is typical of the typhoid and paratyphoid group of fevers

Pulse

The pulse is slower relative to the fever Occasionally the onset is more sudden with rigors severe pain in the back and limbs and prostration high fever remitting in 24 hours The patient shows the typical typhoid appearance by the end of the first week. He has characteristic toxaemic appearance looks dull heavy and stuporous, the face is moist languid and apathetic the pupils are dilated the lips are dry and parched and the tongue is heavily furred on the dorsum with its tip and edges red The abdomen is slightly distended palpation over the caecum commonly elicits gurgling The lower pole of the spleen can sometimes be felt The temperature during this week reaches a maximum of 103° or 104°F and the pulse rate is round about 100 The blood pressure is rather low and the bowels are generally loose with three or four motions a day The stools are yellowish green semi liquid alkaline in reaction and resemble pea soup Often there is no diarrhoea but constipation and the motions are solid throughout The urine often gives the diazo reaction and in severe cases may contain considerable amounts of albumin

Rash

Rose spots—The typi[illegible] nch usually appears after the seventh day but it n[illegible] be delayed till the third week It consists of ros[illegible] papules known as rose spots which blanch on [illegible] are to be seen on the abdomen with perhaps one or two on the back and flanks or on the front of the chest At other times the rash is profuse and thickly scattered over the trunk and may extend to the limbs or to the face In the haemorrhagic type of the disease the rash may be purpuric

Second week

During the second week the fever is high with morning remissions the patient becomes weaker wasted and stuporous prostration increases and there is marked muscular weakness The tongue becomes red and glazed and the teeth are covered with sordes The stools increase in frequency but constipation may be present at this stage and nausea and vomiting may occur abdominal tenderness is nearly always present Abdominal distention with tympanites may be troublesome but sometime the abdomen is sunken and retracted The pulse rate increases from 110 to 140 and the blood pressure progressively falls the systolic pressure usually being below 100 mm Hg A low muttering delirium is often present and repeated epistaxes may occur deafness is often present The temperature remains high (103F or so) but shows slight morning remissions

Third week

During the third week gradual improvement is to be expected in favourable cases In severe cases however it is during this period that great care should be exercised in avoiding such serious complications as hæmorrhage or perforation of the bowel In very severe cases the typhoid state may supervene the patient becomes completely helpless and is unable to turn in bed, lies on his back in a stuporous or delirious condition. There may be tremor of the hands and tongue twitchings of the muscle tendons picking at the bed clothes and incontinence of urine and fæces Retention of urine may occur in some cases There is progressive emaciation and bed sores frequently occur inspite

of good nursing Abdominal distention may be severe and the patient may lapse into a fatal coma or may die from perforation or hæmorrhage When the extensive ulceration of the bowel exists diarrhoea becomes severe and the patient passing 16 to 20 motions daily The stools may show sloughs which have separated from the Payer's patches

In the more common type of case however there is a progressive fall of temperature during the third week, the fever does not reach the peak of previous high point recorded, the morning temperature reaches normal more rapidly than the evening temperature. It usually takes a week for the temperature to settle down to the normal level i.e., this occurs at the end of the fourth week of the disease

The convalescence is established at this period and the patient feels better In some cases the fever may continue and the convalescence thus becomes prolonged Generally the improvement is continued and the temperature may remain sub normal for a week or so The pulse rate is slow but often rather fast and like the temperature, easily disturbed.

become a carrier

Relapses

These occur in about tenth of the cases and commonly about 7 to 10 days after the temperature has become normal. These have been thought to be due to 'overflowing of typhoid bacilli from their localized metastatic or ultimate foci in the body" (Gay), the gall bladder the bone marrow and spleen are the reservoirs from which the circulation is infected Mild attacks are more often followed by relapses than are the more severe ones because the latter probably confer greater immunity The relapse is usually shorter and milder than the original attack but may sometimes end fatally As many as two or more relapses have been recorded after an attack and the writer knows of a case in which fever continued for nearly six months New crops of intestinal lesions may occur, rose spots may reappear and spleens may become enlarged again during a relapse

It is commonly believed that an attack of typhoid gives protection against a second attack. In India the present writer has observed second attacks occurring in a number of cases after a period of months or even years

Types of typhoid fever—In the ambulatory type which is sometimes seen, the patient may keep up and about during the first two weeks or so of his illness but the latter period of the disease in such cases is often severe and frequently ends fatally In mild and abortive types the p[illegible]
stated rarely to occur
pulmonary consolidation
nephritic symptoms are
mucous membranes and purpuric spots appear in the skin

Complications

Perforation

Haemorrhage and perforation—The most important and serious complications of typhoid fever hæmorrhage and perforation are due to ulceration of the Payers patches of the intestine. They usually occur when the sloughs separate during the end of the third or beginning of the fourth week Haemorrhage occurs in 5 to 10 per cent of cases and may be repeated When bleeding is profuse there is a sudden fall of temperature, thin rapid pulse and all the usual signs of internal haemorrhage such as restlessness rapid breathing are present combined eventually with the passage of blood in the stools The blood may be either bright red or tarry according to the situation where bleeding is taking place The quantity may vary from a few drachms to a pint or more. Hæmorrhage may precede intestinal perforation

Perforation occurs in 3 or 4 per cent of cases and is the most serious complication. It usualy occurs in the last two feet of the ileum often near the ileo-caecal valve It is ushered in with severe sudden pain usually in the right iliac fossa accompanied by localized tenderness rigidity and immobility of the abdominal wall vomiting and collapse accompanied by rapid pulse and a cold clammy perspiration The face becomes anxious and pale and the pulse small and increasingly rapid Hiccough may occur later and is persistent and exhausting to the patient. After recovery from the initial shock, the patient is usually better for an hour or two, but thereafter signs of general peritonitis develop

and death usually occurs within 48 hours It must be remembered that the exhausted condition of the patient may mask the pain and *tenderness* and the perforation may be difficult to detect. In such cases the chief *indication may be increasing abdominal* distention and deepening prostration. Perforation is sometimes *preseded by* pain for 2 or 3 days before it occurs and temperature may run straight without any remission It is therefore, important that the abdomen should be carefully *observed daily* to note any signs of impending perforation.

Diagnosis may be made by finding leucocytosis a sudden increase in polymorphonuclears and a preponderance of young non segmented forms. *If the perforation* is pin point in size, diagnosis is difficult and can only be made by frequent differential counts

Symptoms—The abdomen becomes distended owing to loss of tone of *musculature of the gut as a whole.* The respiration and the heart both become embarassed and the risk of perforation is increased due to stretching of the intestinal walls

The liver, gall bladder and spleen.—These may become involved and a mild grade of cholecystitis not *infrequently occurs* Typhoid bacilli are present in the gall bladder from the very beginning *of disease* but *inflammation* is only severe enough in a few cases to cause definite symptoms. *Cholecystitis is recognized* by pain, tenderness and rigidity below the right costal margin. Rarely spleen may be involved and perisplenitis infarct or spontaneous *rupture may occur*

Myocardial degeneration produces increasing cardiac weakness and may terminate fatally The heat *becomes dilated* and the first sound becomes short and rather sharp like the second and *later* a systolic murmur develops The shortening of the diastolic interval produces a tic tac rhythm which is an unfavourable sign Endocarditis and pericarditis *rarely occur Thrombosis of the femoral vein* is *not uncommon* and usually affects the *left side*

Broncho pneumonia and lobar pneumonia are serious complications the infecting *organisms* being typhoid bacillus, pneumococcus and pyogenic cocci Lobar pneumonia frequently occurs during the second and third *week or later*

Mild infections of the urinary tract occurs in about 30 per cent of cases. Typhoid bacilli occur in urine from after the third week of the disease and urine may become turbid on account of presence of typhoid bacilli *Bacilluria may persist and the patient* may become a carrier Pyelitis may occur accompanied by rigors, cystitis may be associated. Meningeal irritation may occur and has to be distinguished from true meningitis by means of lumber puncture

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site 'Typhoid
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chosis, arthritis

(3) Diagnosis

This is ... of E. typhosa in the blood urine or faeces or by
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be obtained ... leucopenia with relative
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suggestive During ... and enlarged spleen are
helpful

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Culture

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in all cases seen during the febrile period irrespective of the stage of the disease Ten ccm of blood from the patient is added to a flask containing 50 ccm of broth with 0 5 per cent sodium taurocholate or peptone water with 0 5 per cent sodium taurocholate and the flask incubated at 37°C Cultures are made on solid media and the organism identified by biochemical and agglutination test A single negative culture is of little value After the second week the organism is more likely to be isolated from urine and fæces

Culture from urine—It is easy to isolate the organisms from urine but procedure is not of much diagnostic value since bacilluria is not a sufficiently frequent character of the disease so that negative results have little value

Culture from stools—The frequency with
increases from first to third week and then
varied bacterial flora so that best results are
media The purpose of the differential mediu
organism and to retard the growth of the other organisms present A selective medium

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this method of laboratory diagnosis is of greatest value

Pasricha Panja and Paul (1940) have described a dilution method for isolation of pathogenic bacteria from faeces It consists in the inoculation of the medium with suitable dilution of a sample of faeces This method is stated to have given better results than the usual method of inoculation An approximate 1 in 10 dilution of the stool is prepared by taking 0 5 ccm or 1 ccm of the stool and suspending it in 4 5 ccm or 9 ccm of broth or sterilised tap water (pH 7 4) From this further tenfold serial dilutions are made up to 1 in 100 000 000 or more as required and 0 5 ccm amounts from each of the four highest dilutions are plated immediately after preparation on suitable medium in large petri-dishes The inoculation is spread by a combination of rotary and tilting movements

Agglutination reactions or the Widal test—The reaction consists in mixing increasing dilution of the serum with the bacterial emulsion and examining for agglutination The test may be performed by macroscopic or microscopic method but the former is preferable The results of the agglutination test are expressed in titers *i e* the highest dilution of the serum that will agglutinate the suspension of a given bacterium The agglutinins usually appear in the blood during the first week and attain their highest titre between the 16th and 22nd days and then gradually fall but can be detected weeks or months after convalescence *Widal's reaction*

It is essential to determine both 'H' and 'O' agglutination as it is known that some cases of enteric infection develop somatic but no flagellar agglutinin and vice versa. It is sufficient to include a single 'O' suspension in the test since 'O agglutination appear to be of much less value in differentiating between one type of enteric infection and another The number of 'H suspensions to be included will depend upon the occurrence of the different types of enteric infection in the particular part of the world in which one happens to be working As a routine it is customary to include 'H' suspensions from *E typhosa, Salmonella paratyphi* A, B and C One of the organisms used should be in diphasic stage and the others in the type phase or the four organisms may be in the type phase and in addition there is included a 'H' suspension from *Vibrio cholerae suis var kunzendorf* (suipestifer) which exists only in the group phase. Agglutination only with the suspension in the group phase shows that some member of the Salmonella other than the organism used in the test is responsible for the infection. Only smooth cultures must be used for preparing the emulsion. The 'H' suspensions consists of formolised broth cultures of the organisms The O' suspension consists of an alcoholised suspension of

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Lesions of bones are not infrequent sequelae to an attack of typhoid fever Periostitis ... as the s te "Typhoid

(3) Diagnosis

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Laboratory diagnosis—The actual isolation and identification of the infecting organism is *the best direct* evidence of typhoid fever All immunological methods, such as agglutination test, are strongly corroborative, but should be considered as subsidiary to the isolation of the organism by blood, stool and urine culture The isolated organism should be identified by biochemical and agglutination tests more reliance being placed on the ... tests as the biochemical test are not very *satisfactory*

Culture

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Culture from stools—The frequency with which *E typhosa* can be isolated from stools increases from first to third week and then falls slowly The faeces contain rich and varied bacterial flora so that best results are obtained by using differential and selective media The purpose of the differential medium is to promote the growth of the required organism and to retard the growth of the other organisms present A selective medium makes the identification of the colonies of the required organism easy as in the preparation of such a medium certain constituents are included, which when acted upon by the organism change the colour of the medium and thus give rise to coloured colonies Broth containing sodium tetrathionate either alone or with brilliant green and bile is one of the best selective medium for isolating *E typhosa* from stools For subculture from this primary culture one of the best differential medium appears to be Wilson and Blairs medium On this medium *E typhosa* gives rise to characteristic black colonies It has been shown that by using a modification of Wilson and Blairs medium (Tabet 1938) it is possible to differentiate *E typhosa* from *S paratyphi* B in 18 24 hours Brilliant green eosin agar medium or McConkey's medium may be used as differential medium McConkey's medium however, is an inferior [illegible] *coli* grows as well on it [illegible] lliant green eosin agar mediu[illegible] f the 129 patients suffering f[illegible] nteric fever positive cultures from fæces can be obtained even during the first week and that this method of laboratory diagnosis is of greatest value

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temperature rises above 103 5°F the patient should be sponged with water at a emperature of about 70°F Even sponging of the extremeties brings down the temperature About 15 to 20 minutes are necessary to sponge patient efficiently each of the limbs the chest abdomen and back being sponged in turn If a bath is required it should be given in a tub big enough to keep the patient under water except his head, the body of the patient is rubbed and friction applied when he is in bath The temperature of the water in the bath varies between 75 to 85°F and the patient remains there for 10 to 15 minutes The bath in most cases brings about distinct improvement *in the condition of* the patient it markedly lowers the temperature which may keep down for hours It brings about an improvement in the circulation is soothing lessens excitability and helps in the elimination of toxins *If the condition of the patient* is serious or there is collapse instead of cold sponging water at about 110°F should be used The patient is lightly covered afterwards and an electric fan if available *is kept going at a slow speed Dilatation of the cutaneous vessels* produced by such sponging increases heat loss from the body and in this way the temperature is lowered Other methods of bringing down temperature are *to cover the patient in a cotton sheet* soaked in water at room temperature and putting him under an electric fan a tray full of ice near the patient and this keeps him surrounded by cool air The tepid sponge bath is the one which can be easily applied and is most acceptable to the patient The only contra indication against the use of hydrotherapy is a recent haemorrhage By proper

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Dietary

Diet—The importance of diet in the treatment of enteric fevers cannot be too strongly stressed It should give adequate nutrition for tissue repair and

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metabolism in enteric fevers with marked

the toxic decomposition of protein of the body and is not due to raised body temperature Experimentally it has been shown that a large amount of carbo hydrates with a moderate quantity of protein helps to maintain the patient in *equilibrium protein diet alone fails to* keep the body metabolism in equilibrium If too much food is given there is liklihood of development of abdominal pain discomfort meteorism hæmorrhage or perforation On the contrary too little food *will starve the patient will delay convalescence* and often the temperature will remain at a higher level until a larger quantity of food is given The condition of the patient must be taken into consideration in severe case it is difficult to give even a *moderate quantity of milk* without producing some discomfort while a mild case requires more food It is now generally agreed that if the patient receives an adequate diet the mortality rate is considerably lowered

In general the diet given should have a caloric value of 3 000 to 4 000 *calories* (corresponding to 50 to 80 calories per kilo body weight) chiefly composed of carbohydrate and protein the latter amounting to about 60 to 90 gm in

24 hours The proteins prevent excessive loss of weight, the carbohydrates give the necessary heat and energy and also oxidise the fats and thereby prevent acidosis

Calories required

The patient may require as much as 4 000 calories a day if loss of tissues is to be prevented With most of the patients this is not possible but the patient should be encouraged to take as much as he can If diarrhœa occurs adjustment of fats and sugars in the diet may control it Patient s liking and disliking of particular articles of food should be considered Easily digestible solid and semi solid foods do not do any harm Nitrogenous and weight equilibrium can be maintained by giving about 4 000 to 5 000 calories with moderate protein content (60 to 90 gm), sugar, oat meal butter, cream, etc forming the chief constituents supplemented with coffee, tea, etc. Carbohydrates form a very important part of the diet and it should be determined which suits the patient best If glucose produces fermentation and is not tolerated give lactose which does not ferment in the gut and provides 120 calories per ounce Dextrin is also easily assimilated and may be used

Proteins are given in form of eggs which leave no residue They can be given either raw or very lightly cooked (boiled, scrambled), 4 to 6 eggs may be given in this way Some of the Indian patients do not tolerate eggs Meat in form of soups should be given with caution but Brands essence of chicken or mutton either cooled on ice in form of Jelly or hot in form of soups are palatable liked by patients and are well tolerated Rice gruel (Kanji) may be used Broth may be prepared from finely chopped mutton or chicken

Fruit juices prepared from oranges, grapes, grape fruit lemons tomatoes etc, are acceptable and form a good vehicle for administering sugar They some time produce diarrhœa and abdominal distension and should be with held if this happens Food should be given at regular intervals every two or three hours and after every feed the mouth be rinsed out thoroughly with an alkaline solution

Liquid food

The bulk of the food should be liquid, milk or its modifications such as peptonised milk malted milk butter milk or whey are given at interval of 2 to 3 hours according to the condition of the patient Two to three pints of milk can be administered in 24 hours if diarrhoea is not present Chicken or mutton may be substituted if milk is not well borne and as much water should be given as possible It should be remembered that caloric value of milk is low, being only about 20 calories to the ounce and large quantities will have to be given [illegible] t is not [illegible] putting [illegible] drinks [illegible] weak tea forms an excellent diuretic drink and patient should be encouraged to take it Sometime milk becomes distasteful and in such cases condensed milk preparations whey, junket cream soups, custard, sago cooked in milk or water, curds (dahi) may be used

If there is diarrhœa and much fermentation in the intestine the diet should be very simple and consist entirely of whey or glucose Water may be given freely and as much as 3 to 4 litres of water should be consumed in a day Barley water, lemonade and soda water are also useful Glucose and lactose may be advantageously given frequently A good drink can be prepared by the addition of some alkali such as bicarbonate of soda and lactose to water it should be given as often as the patient feels thirsty and is an efficient diuretic. (See section on diet in disease)

rise of temperature and if this happens it should be stopped Other drugs of this group are not indicated in the present state of knowledge

Chloramphenicol in doses of 4 gm in the first hour, followed by 0·25 gm. 2 hourly until temperature is normal and thereafter 4 hourly for the rest of the course to a total of 15 to 20 gm is said to have a specific effect

It may be stressed here that it is the duty of the physician in charge of typhoid case to very carefully examine the patient daily during the acute stage of the disease He should make sure that the nurses are doing their work properly The abdomen
of disten ion noted and
is properly emptied and
or blood The back of
should be frequently changed to prevent hypostatic congestion A four hourly temperature, pulse and respiration chart is important and any sudden drop of temperature should be noted The intake of food and the amount of urine passed should be scrutinized

(6) Treatment of complications

Hæmorrhage

Hæmorrhage—The treatment of hæmorrhage should be prompt and requires the greatest care Hæmorrhage is most likely to occur after the second week and in the majority of cases a history of persistent diarrhœa may be traced In hæmorrhage absolute rest is essential and such sedatives as morphine, codeine or sodium luminal should be given Morphine produces excitement in some patients and therefore, codeine is preferred An ice bag should be placed on the abdomen and food with-held for eight to twelve hours and the stools watched for blood The use of normal horse serum (10 to 20 ccm) or hæmoplastin in 2 ccm doses is of proven value, calcium chloride, 5 to 10 ccm of a 10 per cent solution, may ... in doses of 10 to 20 ccm given intram ... ccess In serious cases transfusion of ... of plasma may be given twice daily or this may be alternated with 500 ccm of whole blood Vitamin K (if available) should be given in doses of 2 to 4 mgm twice daily by the intravenous route with 1,000 mgm of ascorbic acid, or ascorbic acid should be given by itself

Nothing should be given by the mouth, not even fluid, if hæmorrhage is severe A mixture of gelatine 1 part, lactose 3 parts and water 30 parts may be given by the mouth three ounces at a time, mixed with orange juice every 2 or 3 hours for the first 2 or 3 days After this soft gruel 16 parts, milk 14 parts, cream 4 parts and lactose 3 parts may be given alternately with the above After a few days give eggflip or soft boiled eggs Malted milk mixed with ordinary milk and beaten up with a raw egg and ice cream are well tolerated When hæmorrhage has completely stopped soft easily digestible food such as clear vegetable broth strained oat meal rice water (Kanji) may be given in amounts not exceeding two ounces every hour or two hours As hæmorrhage is likely to recur it is imperative that the patient be carefully watched

Fluids should preferably be given by intramuscular or intravenous drip in preference to the intravenous route to avoid too rapid increase in volume especially if plasma is not given At least 1 000 ccm should be given twice daily By the mouth fluids should be given sparingly for the first few days of a large hæmorrhage

There is no unanimity of opinion regarding the use of morphine It is, however, the usual practice with many to give opiates by the mouth as these stop peristalsis as well as the sensation of hunger and thirst Usually Dover's

powder is preferred and is given in doses of five grains the dose being repeated if the patient has not fallen asleep by that time After this the dose is repeated four or six hourly for 48 hours In severe cases an injection of 1/4 to 1/2 grain of morphine is given at first followed by opium in form of Dover s powder by the mouth

Perforation—The first thing to do is to apply an ice-bag to the abdomen and administer fluids intravenously to combat shock For this 2 000 ccm of 5 per cent glucose are given daily plasma may be given in doses of 500 ccm twice daily or whole blood may be given Morphine is indicated in large doses to obtain perfect rest and the patient should be kept warm Peritonitis which may be generalised is most serious and even with prompt surgical treatment and other measures mortality is over 80 per cent. In the treatment of this condition penicillin and such drugs as sulphathiazole sulphadiazine etc have made remarkable difference in the mortality rate (See section on penicillin and sulphonamides) *Perforation*

If perforation occurs the only means of saving the life of patient is by doing immediate laparotomy unless the patient is already moribund The perforation should be located and stitched brought near to the wound in the skin and drained Perforation should be looked for in the last 18 inches of ilium and if not found there the caecum and ascending colon should be examined Ulcerated gall bladder may rupture giving rise to similar symptoms

Tympanitis and paralytic distension is of grave significance and should be immediately treated with turpentine by mouth in 20 minim doses in mucilage every 2 or 3 hours Turpentine stupes should also be applied to the abdomen relieved by intravenous injection of 5 to 10 ounces of 0 5 per cent sodium citrate solution and this may also prevent extension of the clot

If bacilluria and cystitis are present 10 to 15 grains of hexamine may be given by the mouth with plenty of water to prevent irritation of the urinary tract

Suppurative parotitis cholecystitis periostitis necrosis of bone require surgical intervention

Specific and non specific vaccines—Conflicting results have been obtained with subcutaneous and even intravenous injections of typhoid vaccine in the treatment of the disease The study of the records shows that this method of treatment is of doubtful value Vaccine given for protection will not check an infection already installed and incubating and likewise the statistical record of cases treated with vaccines does not show that this has a material advantage over other forms of treatment Moreover in some cases it has been stated that the use of vaccines may predispose the patient to hæmorrhage

Non specific vaccines have been tried in enteric fever and are said to have given good results in many cases especially those complicated with bone lesions The treatment consists in giving intravenously foreign proteins *e g E coli* vaccine in doses of 10 to 20 million organisms per ccm A reaction is produced which is characterised by fever chill and leucocytosis after an injection In no case should the vaccine used be old and stored for a long time Whenever possible freshly prepared vaccines should be given a trial as early in the course of the disease as possible *Vaccines and phage*

Bacteriophage—The value of the administration of bacteriophage in the treatment of enteric fevers has not as yet been established In vitro lytic

principles may be obtained which have a marked effect on *E typhosa* It is therefore preferable if possible to obtain phage that will lyse the specific bacteria The doses are 2 ccm every four hours for five or six days It can be similarl employed as a prophylactic during an epidemic (See also bacteriophage therapy

Convalescence

Convalescence —The management of the period of convalescence is very important The diet should be gradually increased and it is best to wait for week or ten days after the temperature is normal before resorting to solid food Dietery indiscrimination may produce fever and mental excitement The patien *should be allowed to get up gradually*, all strain and over exertion are to be avoided as this may Constipa tion is to be partici *paraffin* and enemas After an f possible a period of rest in the country or to some health resort before returning to his ordinary mode of life Urine and fæces should be examined for presence of bacilli on several occasions during convalescence Negative results do not *definitely exclude the carrier stage as sometime bacilli only intermittently* occur in the excreta

numerable difficulties In such doses Autogenous vaccines of these carriers particular id fæces and they should not be allowed to handle food

(7) Propylaxis

The prophylactic measures in enteric fevers consist in the prevention of dissemination of excreta from patients convalescent or healthy carriers so that they do not convey infection into the system of sewage disposal Secondly the disposal of infected sewage should be such as not to reach and contaminate the *water supply or be accessible to flies Where the disease is endemic or during* the period of an epidemic special precautions should be taken to avoid all predisposing factors Drinking water should always be boiled and special attention is necessary to ensure the purity of milk butter or other food stuff that might directly or indirectly be exposed to infection Typhoid patients should *be isolated as early as possible The excreta must be disinfected* as well as all objects used by the patient *viz* linen utensils thermometer etc Release from isolation station should be determined by successive negative cultures of stool and urine specimens collected not less than 24 hours apart

Vaccines

The advent of prophylactic inoculation has greatly reduced the incidence of both typhoid and paratyphoid infections Statistical evidence of the use of vaccine in epidemic and endemic areas shows that it considerably reduces the susceptibility of the individual to the disease and the case mortality shows a marked decrease after the use of this prophylactic inoculation The vaccine *which is generally known as T A B vaccine contains 1 000 million of typhoid* bacilli 500 millions each of paratyphoid A and B in each ccm The organism is grown on trypsin agar washed in saline and usually killed by heating to 56°C for one hour in a water bath 0 25 per cent tricresol or 0 4 per cent of lysol is added as a preservative If formalin is used for killing cultures the 0 antigen *concerned with immunity is adversely affected whereas heating to 60°C or higher* leaves this antigen intact It has been shown that alcohol killed and alcohol preserved typhoid vaccines stimulate antibody formation in contrast to ordinary

vaccine which produces negligible amounts In addition these vaccines produce milder reactions Three doses of vaccine are administered at weekly intervals, 0 5 ccm for first dose 1 0 ccm second dose and 1 0 ccm third dose In females smaller doses are given i e, 0 4 ccm first dose and 0 75 subsequent doses In children below 12 years of age half of the adult dose is given

Mouse protection test has been evolved for detection and measurement of the concentration of specific protective substances in the blood and for determining the duration of immunity following initial immunization and subsequent re-immunization It has been shown that after repeated immunization the protective antibody content of the blood becomes stabilized at high level where it stays for prolonged periods after initial immunization with three doses Vaccination may be performed again after three years and again at the end of further three years In cases of emergency only vaccination may be done after one or two years For purposes of revaccination a single dose of vaccine (one thousand million of *E typhosa*) in doses of 1 0 ccm is necessary Oral immunization has been shown to produce no material increase in the protective antibody as measured by mouse protection test

It should be borne in mind that the effective response is not attained until twenty to twenty eight days after the first dose of vaccine This method has, however, the advantage that the increased resistance when once, attained, lasts over a relatively long period probably over a year or two It follows that active immunization will exert its maximal effect on persons who are unlikely to be exposed to the risk of infection during the few weeks following the injection of vaccine but who will then be exposed to an appreciable risk over a relatively long period There is considerable amount of laboratory evidence that indicates the existence of a *negative phase* following the injection of bacterial antigen During this phase the titre of certain antibodies in the blood may be lowered, and this possibly connotes a phase of decreased resistance to infection It is probable that within two or three days of the first inoculation of vaccine a person's resistance is rather higher than before in uninfected persons wholesale vaccination would therefore, slightly lower the incidence of the disease or reduce its severity In regard to the vaccination of persons already incubating the disease the position is different In this stage the patient is already infected and the bacteria are multiplying in his tissues though no clinical signs have yet been produced The transient effects of the negative phase even though we may regard them as negligible in an uninfected person may well disturb an already changing balance between parasites and the host to the disadvantage of the latter

2. PARATYPHOID FEVER

Paratyphoid fever is difficult to differentiate from typhoid clinically but by bacteriological and serological methods a definite diagnosis can be made They are quite separate entities and one infection does not confer immunity to the other infection *Salmonella paratyphi* A, B and C which produce this disease can be readily grown from the blood urine and fæces in the same way as *E typhosa* Paratyphoid B more commonly occurs in Europe, America and other temperate regions and C occurs in the south eastern parts of Europe particularly in the Balkans In India the paratyphoid A infection is commonly met with, others are rarely seen *Paratyphoid A B and C*

Pathology—Pathological lesions produced are more or less the same as those of typhoid the ulceration of lymphoid tissue in the intestine is however much milder though the ulcers may be more numerous in the colon and rectum Such complications as splenic abscess and bronchopneumonia are commoner in paratyphoid

Clinical aspects—Paratyphoid fever produces usually much milder symptoms than typhoid and the duration of fever is shorter The onset is more abrupt and gastro intestinal symptoms *e g* diarrhœa vomiting etc are more marked The temperature rises more abruptly and gastro intestinal symptoms *e g* diarrhœa vomiting etc are more marked The temperature attains its maximum on the third day remains at that level for 7 or 8 days with marked daily remissions it falls by lysis The course is often less than a fortnight (*unless there is relapse*) as compared with over three weeks of typhoid Toxæmia is much less marked though headache apathy enlargement of spleen and tumidity of abdomen are present Rigors may occur and sweating and herpes are more common Eruption occurs about the 7th day is more profuse and individual rose spots are larger

Complications similar to typhoid occur but pulmonary and other complications are milder Perforation and typhoid state are rare

Paratyphoid A runs a longer course than B and positive Widal appears later *Paratyphoid A is believed to produce a larger number of carriers than B and C* *Mortality* rate in paratyphoid is much lower

Diagnosis from typhoid—This can be made by blood culture or agglutination tests though paratyphoid C often fails to produce agglutinins Leucopenia is less marked than in typhoid

Treatment—On the same lines as typhoid

3 ENTERIC-LIKE FEVERS

Coliform Infection

B coli infection

At a very early stage *Escherichia coli* appears in the intestine of the infant and throughout life man carries these germs in his colon In health *Esch coli* is confined to the large intestine or at any rate does not extend far beyond the *ileocaecal valve into the small intestine*

Normally barriers exist against the escape of organisms into the lymphatics or blood stream and these are —(1) The intact intestinal epithelium (2) mucus secretion and (3) the lymphoid tissue found in the intestinal wall and the lymphatic glands which lie in relation to the ileocolic vessels But conditions which disturb the above protective mechanism and facilitate the escape of bacteria may be set up (1) by disease of the bowel of which chronic intestinal stasis is the most common, or by abdominal operation and (2) by treatment of which the most frequent is violent purgation

are also apt to occur as a sequel to debilitating conditions such as enteric fever [illegible] fevers Urinary stasis secondary to urinary calculus strictures enlarged prostate gravid uterus etc may also be contributory factors *Esch coli* infections of the urinary tract may be ingrafted on tuberculous lesions *The coliform organisms reach the pelvis of the* [illegible] bladder by the urethra as well as by the blood stream Dudgeon Wordley

hæmic route of infection *Esch coli* may cause a primary [illegible] *occasionally the reverse is the case* In the pelvis of the kidney there is a catarrhal inflammation extending on to the papillae and in some cases multiple foci of suppuration may occur in the kidney substance from which the organism intermittently escape in the urine The symptoms of coliform infection of the urinary tract are pain and frequency *of micturition* and *usually a* rise of temperature Not infrequently there are rigors and the patient is acutely ill The urine is strongly acid and contains numerous pus *cells* *Esch coli* is easily isolated on culture In cystitis if a blood culture is made during a [illegible] *Esch coli* may be isolated Whether such bacilli gained access to the blood *from* the intestine *or from* the bladder lesion is undecided

Anotl er diseased cond tion associated with *Esch coli* is cholecystitis In such cases *Es h co i* cannot be cultivated from the blood unless abscesses are present in the internal organs Possett (1927) from a review of the literature of the action of *Esch coli* in cholangitis and cholecystitis concluded that infection passes to the liver directly from the intestine and not by the blood stream Moynihan (1927) believed that the peritoneal coat of the gall bladder is first infected presumably from *Esch coli* that have passed from the intestine into the peritoneal cavity The introduction of *Esch coli* into the healthy bla
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production of cholecystitis

Septicaemia due to *Esch coli* is very rare but it may be found when there is a focus of suppuration *e g* abscess in the liver or during rigor in cystitis or in acute infective processes In new born children a fatal condition known as Winckl s disease is a hæmorrhagic septicæmia produced by *Esch coli* (Felty and Keefer 1924) If the organism enter the blood stream it gives rise to prolonged fever resembling enteric fever Septicaemia and pyaemia due to *Esch coli* are believed to occur as a sequel to amœbic and bacillary dysentery in the weak and debil tated individuals in countries like Ind a The onset is generally sudden with headache acute pain in the loins rigors and profuse sweats The patient looks toxic and gets into a stuperose condition resembling enteric fever The condition may also be mistaken for malaria Blood culture is positive to *Esch coli* especially if taken in the rigor stage and the urine is also positive

Whether *Esch coli* or its products can on ingestion cause diarrhoea is still uncertain
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Esch coli when swallowed may cause gastro intestinal disturbance The problem of the causation of diarrhœa in infants and as to how far *Esch coli* is to be incriminated is far from being settled

Esch coli probably does not pass through the healthy bowel into the peritoneal cavity but wl en the bowel is damaged by trauma or strangulation such passage occurs giving rise to peritonitis It is sometimes found as the sole infecting agent in abscesses found in the region of the anus and urethra

Treatment of urinary infection with coliform organisms —In the acute stage the patient must be kept in bed so as to ensure rest and warmth Even in the chronic stage it is important to avoid cold and fatigue As the bowel is the source of nearly all the infections it must be carefully attended to A good initial purgative should be given and then the bowel should be kept open daily *Urinary infectio*
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30 gr syrup of orange ½ dr and water 1 oz is given four hourly As soon as the urine is alkaline the temperature usually falls and the mixture can later be given six hourly and then three times a day or as required Hexamine in 10 gr doses in a glass of water should now be given three times a day before food After the food a mixture containing acid sodium phosphate 30 gr tincture of hyoscyamus ½ dr, and chloroform water up to 1 oz is given The alkaline

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Of the intestinal affections those showing signs of irritation of the mucous membrane *e g* colitis chronic diarrhœa diverticulitis seem more prone to give rise to urinary infection than atonic states of the colon with simple constipation Intestinal infection when it is complicated is specially liable to extend to two organs *i e*, the gall bladder setting up infective cholecystitis and the urinary tract giving rise to pyelitis and cystitis Thes are *also apt to occur as a sequel to debilitating conditions such as enteric fever or othe* fevers Urinary stasis secondary to urinary calculus strictures enlarged prostate, gravi uterus etc may also be contributory factors *Esch coli* infections of the urinary trac may be ingrafted on tuberculous lesions The coliform organisms reach the pelvis of th *kidney and the bladder by the urethra as well as by the blood stream Dudgeon, Wardle* the ligh infected d stream ommonly is to the titis but

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from the gall bladder and any extraneous focus of infection *e g*, appendix assist in the production of cholecystitis

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sudden with headache acute pain in the loins rigors and profuse sweats The patient looks toxic and gets into a stuperose condition resembling enteric fever The condition may also be mistaken for malaria. Blood culture is positive to *Esch coli* especially if taken in the rigor stage and the urine is also positive

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Treatment of urinary infection with coliform organisms —In the acute stage the patient must be kept in bed so as to ensure rest and warmth Even in the chronic stage it is important to avoid cold and fatigue As the bowel is the source of nearly all the infections it must be carefully attended to A good initial purgative should be given and then the bowel should be kept open daily with cascara, some advise liquid paraffin and agar along with high colon lavage Suitable diet is of great importance Too much milk must not be given, but the patient should take plenty of fluid (6 to 8 pints daily) Diet should be low in total protein content meat, eggs and raw milk are excluded entirely, junket whey, butter milk and cream being allowed Rice bread, honey, butter porridge, vegetables, fish and chicken are gradually allowed when the acute symptoms have subsided *Urinary infection*

In acute cases with pyrexia full doses of alkalis are very helpful and should be continued until the urine has been rendered alkaline for 3 or 4 days A mixture of sodium bicarbonate 30 gr sodium citrate 30 gr potassium acetate 30 gr, syrup of orange ½ dr and water 1 oz, is given four hourly As soon as the urine is alkaline the temperature usually falls and the mixture can later be given six hourly and then three times a day or as required Hexamine in 10 gr doses in a glass of water should now be given three times a day before food After the food a mixture containing acid sodium phosphate 30 gr tincture of hyoscyamus ½ dr, and chloroform water up to 1 oz is given The alkaline

and acid treatment should be alternated every 3 days It is well to change the hexamine for one or other of its derivatives *e g*, cystopurin helmitol etc, every now and then Urotropine may be given intravenously in doses of 2 to 5 ccm of a 40 per cent solution

Treatment

Mandelic acid treatment—This is based on the fact that excretion of ketone bodies in the urine is detrimental to *Esch coli* and that administration of mandelic acid *produces similar changes in the urine* Mandelic acid is related chemically to B hydroxybutyric acid and after its administration the urine becomes highly acid (pH 5 as estimated by methyl red indicator) and acetone bodies occur in the urine Mandelic acid is not now used as such and it is much more convenient to use such preparations as ammonium mandelate *mandelin mandecal etc in* doses of 1 to 2 drachm three times a day directly after meals until urine becomes markedly acid The fluid intake is restricted to 40 ounces daily to maintain proper concentration

Sulphonamides—These drugs are effective against *Esch coli* and are particularly useful in the infections of the urinary tract Manson Bahr has tried sulphapyridine and sulphadiazine *in doses of 3 0 gm daily for 10 to 14 days* The bactericidal power of urine depends on the concentration of the sulphonamide *(For details see section on Sulphonamide drugs) The treatment may be followed* by mandelic acid therapy

Before trying any of the therapeutic measures it is advisable to carry out investigations of the kidney and ureters with uroselection etc as a calculus may be the cause of *infection with Esch coli and may have to be dealt with surgically*

Ketogenic diet—Although on account of introduction of new potent drugs this is not used it may be described here Ketogenic diet is based on the observations that the urine of patients suffering from diabetes with ketonuria and patients treated with ketogenic diet for epilepsy does not putrefy on standing for several days in a warm room Presumably the urine contains some substance which prevents the multiplication of micro-organisms Sbohl and Janney (1917) showed that when the reaction becomes acid with a pH of 5 to 4 6 the growth of *Esch coli* is inhibited

The ketogenic diet in the treatment of pyelitis was first introduced by Helmholtz and Clark in 1931 T [illegible] d d ed some cha ge the urine which
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and that the activity of this substance increases in proportion to the acidity of urine The *clinical application* of ketogenic diets in *Esch coli* infections has been worked out by *various workers The treatment* consists of giving diet which will produce ketosis and if the pH does not fall below 5 ammonium nitrate or chloride is given in doses of 0 5 gm three times a day The ketogenic diet contains a preponderance of fats over carbohydrates and proteins It is usually necessary to use a diet with a ratio of 3 1 *i e* F=3 (C+P) If this diet does not produce ketosis then the carbohydrates may be reduced by 5 gm every three days Ordinarily a ketogenic diet consists of protein 60 gm carbohydrate 20 gm and fat 240 gm *A normal amount of fluid (2 to 3* pints) is taken in the form of water and it is essential that no other food is taken The urine should be tested daily for pH value and ketone bodies and the result of treatment judged by cultures of the urine

In some cases this diet may fail to maintain this standard of urinary ketosis It has been suggested that ammonium chloride in daily doses of *125 gr in addition to other* measures may bring down the pH to 5 Poulton observed that he found a more marked ketosis if more protein was given in the diet and he advises an alternate method by giving calcium chloride in doses of 7½ gr daily

rs in the gut, gives rise to mild pyrexia of organism is not pathogenic but when it g fever lasting from 2 to 15 days, with an evening rise and marked morning remission The pulse runs slow as compared to the height of the temperature and the tongue and other symptoms resemble those of a mild case of enteric Agglutination with homologous strains of organism may occur in dilutions of 1 in 50.

Bacilli of salmonella group, *e g*, *S enteritidis* (Gaertner's bacillus), *S aertrycke* (*S typhimurium*) and *B suipestifer* (*S cholerae suis*) have been isolated from the blood stream in food poisoning They produce symptoms very much like enteric fever The onset is however, sudden rigors occur, gastro intestinal symptoms are marked and fever terminates rapidly

IV. CHOLERA

(Asiatic Cholera)

1. General Consideration

Cholera is an acute specific gastro intestinal affection caused by *Vibrio cholerae* or comma bacillus It is characterized by vomiting, profuse and effortless diarrhoea, muscular cramps, collapse and suppression of urine The incubation period is 1 to 5 days usually 3 days, and the disease may run a course of a few hours to a few days The vibrio primarily multiplies in the small intestine

Historical

India is considered to be one of the chief sources of infection of cholera It is endemic in the delta of the Ganges and the various world-wide epidemics can be traced to that source. Though it is customary to speak of Lower Bengal as the home ern localities, viz Bankok, Canton, Only in such countries as Siam proportion of the populations still s and creeks does the menace of cholera persist There is some vague reference to this disease in ancient Greek literature Susruta in India, in the 7th century A D described a disease with symptoms and signs se in India were published by 15th 16th and 18th centuries he 19th century and its early ie pandemic of 1817 the infec- holera visited Europe for the emics *i e*, 1848 1851, 1851 55 ed seriously in four of these 870-73 epidemic spared Great 1 States f a German Commission took its arrival in Alexandria the It was in the Medical College ra and 28 autopsies Koch in of the disease and in his 84 Koch gave an account of of the last fifty years Koch *rio cholerae* is the cause of ceptance of Koch's conclus on os in places where there was of these vibrios started in id has been in existe ice for y half a century

(1) Epidemiology

Effect of Season and rainfall

Seasonal incidence and climatic conditions—The seasonal incidence of cholera in any given area, is remarkably constant from year to year, yet differs widely in different provinces This is believed to be dependant on the average absolute humidity or aqueous vapour tension Cholera is never wide spread if the aqueous vapour tension is below 0.4 inches Hg

and acid treatment should be alternated every 3 days It is well to change the hexamine for one or other of its derivatives *e g*, cystopurin, helmitol etc every now and then *Urotropine may be given intravenously in doses of 2 to 5 ccm* of a 40 per cent solution

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The ketogenic diet in the treatment of pyelitis was first introduced by Helmholtz and Clark in 1931 Though they showed that the diet produced some change in the urine which *makes it inhibit the growth of bacteria the precise manner of its* action was not determined All workers now agree that the change in reaction of the urine is not the only factor causing inhibition of the growth Ketonic urine inhibits the growth of *Esch coli* to a much greater extent than normal urine rendered acid to the same degree by the use of acidi[illegible] be due to the presence of some bactericidal subst[illegible] rial growth even when the reaction of urine [illegible] (1933) stated that bacterial growth in the [illegible] which is excreted after ketogenic diet and [illegible] roportion to the acidity of urine. The clinic[illegible] *coli infections has been worked out* by [illegible] of giving diet which will produce ketosis and [illegible] 5 ammonium nitrate or chloride is given in doses of 0 5 gm three times a day The ketogenic diet contains a preponderance *of fats over* carbohydrates and proteins It is usually necessary to use a diet with a ratio of 3 1 *i e* F=3 (C+P) If this diet does not produce ketosis then the carbohydrates may be reduced by 5 gm every three days Ordinarily a ketogenic diet consists of protein 60 gm carbohydrate 20 gm and fat 240 gm A normal amount of fluid (2 to 3 pints) is taken in the form of water and it is essential that no other food is taken The urine should be tested daily for pH value and ketone bodies and *the result of treatment* judged by cultures of the urine

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Other infections producing enteric like fever
Infection with *B faecalis alkaligenes* which occurs in the gut, gives rise to mild pyrexia of remittent or intermittent type Ordinarily this organism is not pathogenic but when it gains access to the blood stream, it may produce fever lasting from 2 to 15 days with an evening rise and marked morning remission The pulse runs slow as compared to the height of the temperature and the tongue and other symptoms resemble those of a mild case of enteric. Agglutination with homologous strains of organism may occur in dilutions of 1 in 50.

Bacilli of salmonella group, *e g* *S enteritidis* (Gaertner's bacillus), *S aertycke* (*S typhimurium*) and *B suipestifer* (*S cholerae suis*) have been isolated from the blood stream in food poisoning They produce symptoms very much like enteric fever The onset is however, sudden, rigors occur, gastro intestinal symptoms are marked and fever terminates rapidly

IV. CHOLERA

(Asiatic Cholera)

1. General Consideration

Cholera is an acute specific gastro intestinal affection caused by *Vibrio cholerae* or comma bacillus It is characterized by vomiting, profuse and effortless diarrhoea, muscular cramps, collapse and suppression of urine The incubation period is 1 to 5 days usually 3 days, and the disease may run a course of a few hours to a few days The vibrio primarily multiplies in the small intestine

Historical

India is considered to be one of the chief sources of infection of cholera It is endemic in the delta of the Ganges and the various world wide epidemics can be traced to that source. Though it is customary to speak of Lower Bengal as the home of cholera
ern localities viz, Bankok, Canton
Only in such countries as Siam
proportion of the populations still
and creeks does the menace of
cholera persist There is some vague reference to this disease in ancient Greek literature Susruta in India, in the 7th century A D described a disease with symptoms and signs of
sease in India were published by
e 15th 16th and 18th centuries
e the 19th century and its early
the pandemic of 1817 the infec-
o cholera visited Europe for the
pidemics *i e*, 1848-1851, 1851 55
olved seriously in four of these
1870-73 epidemic spared Great
ted States
of a German Commission took
his arrival in Alexandria the
It was in the Medical College
olera and 28 autopsies Koch in
the winter of 1883-84 worked out completely the aetiology of the disease, and in his report at the first conference on cholera held in Berlin in 1884 Koch gave an account of the organism which has been but little altered by the work of the last fifty years Koch definitely established that the organism now known as *Vibrio cholerae* is the cause of cholera. At first there was considerable opposition to the acceptance of Koch s conclusion and this opposition was strengthened by the finding of vibrios in places where there was no cholera. A considerable controversy on the significance of these vibrios started in 1884 just a year after Koch s discovery of the organism and has been in existence for nearly half a century

(1) Epidemiology

Effect of Season and rainfall

Seasonal incidence and climatic conditions—The seasonal incidence of cholera in any given area, is remarkably constant from year to year, yet differs widely in different provinces This is believed to be dependant on the average absolute humidity or aqueous vapour tension. Cholera is never wide spread if the aqueous vapour tension is below 0.4 inches Hg

digestion) It is rapidly killed by exposure to heat at 55°C or by *exposure to chemicals* e g 0 5 per cent phenol 1 in 100,000 perchloride of mercury in 10 minutes also by chlorinated lime or cylin (solution of creolin) The organism is resistant to low temperatures (survives in ice) and may *survive for several days in sea water* In ordinary water the vibrios remain viable for a considerable time, in reservoir water they have been shown to live for two weeks In grossly contaminated water or sewage the organism is killed by *overgrowth of putrefactive bacteria* *In stools* the vibrios may remain active only for a day or two in warm weather and for a week or so in cold weather The vibrio rapidly multiplies in milk

Pathogenicity —A disease resembling cholera has been produced in guinea pigs and rabbits [illegible] experimental [illegible] In man there have been many accidental infections [illegible] holera vibrio were [illegible] holera was due to [illegible] an have however [illegible] writer has come across cases where a number of persons have partaken an infected meal and only one or two have had the disease

Individual susceptibility to infection varies but complete immunity probably does not exist The determining factor is probably gastric acidity and when this is high vibrios are destroyed In achlorhydria they survive for a considerable time This explains why water is such a common medium of infection Any factor which lowers the resistance of the patient *e g*, starvation fatigue debility alcoholism excessive purgation increases susceptibility to infection

Carriers

Cholera carriers —*Vibrio cholerae* can usually be cultivated from the stools for 3 to 5 days of the disease and in 90 per cent of the case [illegible] days In a small percentage the organisms persists occasionally from 5 to 7 weeks Only a very sm[illegible] true chronic carriers (like the typhoid carriers) an[illegible] Though this stage may be very rare the temporary c[illegible] recently recovered individuals) are by far the most [illegible] vibrios It is said that in epidemics 1 to 10 per [illegible] vibrios There are two established categories of carriers—incubatory and convalescent It has been stated that healthy carriers also exist *i e* healthy persons who have been in contact with cholera cases may become infected and excrete the vibrios without getting the clinical disease The existence of such healthy carriers has not however been definitely proved The isolation of vibrios which can be agglutinated only by a cholera H serum and not by a standard cholera O serum has not got much significance As regards the convalescent carriers fortunately they are only transient carriers and chronic carriers do not exist About 90 per cent of the convalescents usually become free from infection within a fortnight and about 99 per cent within a month, occasionally vibrios may persist for longer periods According to Taylor convalescent and contact carriers generally become free from vibrios five days from the onset of the attack or contact It has been shown that many persons begin to excrete vibrios in their stools a day or so before the clinical onset of the disease Such incubatory carriers are certainly dangerous to the community

Immunity —In man some natural immunity exists and *new comers to an endemic area* are more likely to catch infection than the residents One attack does not confer protection from a subsequent attack and there are instances of people getting 2 or 3 attacks Active immunity can be produced by vaccination but it *does not last for more than six months* Active immunity can be induced in animals and sera with high titre agglutinins can be produced by *injection of killed cultures of vibrio*

[illegible]
with others there is no change

An agglutination reaction is not obtained from blood serum during the acute stage of the disease but is present after 8 to 10 days after commencement reaching a maximum (up to 1 in 1 000) in four weeks

Transmission—The two main methods of the transmission of the diseases are water-borne infection and case or carrier infection In the water borne infection the water supply of a town village or community is infected by the excreta of a cholera patient or carrier and this may be followed by an epidemic of cholera which is generally of an explosive nature

Flies

infection by means of mechanical transference of infected material to articles of food. Food handled by infected persons is dangerous so are uncooked foods, vegetables, salads, celery, etc, which have been grown with night soil as manure Uncooked or lightly cooked shellfish provides a ready means of transmission

Dissemination by human beings is the most important factor in cholera epidemiology Cholera follows the great routes of human intercourse In India during the religious gatherings, people are collected together in large numbers and under highly insanitary conditions, cholera breaks out among them and when they separate and proceed homewards they carry the disease along with them infecting the people of the places they passes through Cholera never travels faster than man but in modern times owing to increased speed of locomotion, epidemics advance more rapidly and follow a more erratic course than they did years ago They always follow lines of communications by river, road rail or ship Although the disease travels along the trade routes, it never advances far unless along its path there are places where sanitary conditions are such as will help the disease to take root and start afresh

(3) Pathology

In the most acute cases the very varied normal intestinal flora may be practically completely replaced within a few hours by an almost pure culture of cholera vibrios enormous numbers of which are constantly disintegrating and setting free their endotoxins to be absorbed through the damaged intestinal mucosa Equally striking is the rapid disappearance of the vibrios usually within a few days during convalescence Comparatively few of the organisms appear to enter the system

Changes in gut

The epithelial lining of the mucous membrane is shed, with the result that fluid pours out from the blood into the lumen of the bowel and toxins are absorbed into the system leading to collapse from failure of circulation The peritoneal surface of the small intestine is sticky and congested, its mucous membrane is greatly congested and the lymphoid follicles of the intestine and spleen are very prominent The stomach and upper

and temporary ischaemia during the failure of circulation may produce irreversible changes in the kidney which are not detectable microscopically Focal necrosis with hyaline changes and sclerotic atrophy have been described in kidneys

There is unusual dryness of the body surface leaden hue of the skin the body, cavities when opened are dry and serous cavities are without fluid The muscles are dry and dark red the lungs are shrunken and their vessels contain dark viscid blood The gall bladder is usually distended and contains thick bile The omentum is shrivelled up and the peritoneal coat of the intestine is congested

The great loss of fluid from the blood results in a rise in the red corpuscles from 5 to 7 or 8 millions and white cells from 15000 to 20000 per cmm so that on opening a vein the blood is thick and may be almost like tar The loss of salts from the blood is equally important, and inspite of the great hæmoconcentration they may be below normal It is estimated that as much as 100 gm of sodium chloride may be lost in vomitus and 35 gm in the stools in 24 hours There is a great reduction at the sametime of alkali reserve and this leads to retention of nitrogenous waste products which further increase renal failure The salts are lost to an even greater extent than the fluids and this explains the efficacy of injection of hypertonic salines to replace the lost salts Rogers claims that chlorides combine with and neutralize toxins in the blood and cause their excretion through the kidneys

Cultivation of stools—The fæces should be cultivated in a tube of ordinary peptone water The material to be examined is inoculated into 1 0 per cent peptone water (Dunhams peptone with a pH of 9 0 to 9 5) *to which 0 5 per cent of* sodium chloride is added After the addition of suspected material the reaction should be distinctly alkaline After about 6—12 hours incubation a loopful from the top of the inoculated tube should be examined If the
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make subcultures into peptone water and on an agar plate for cholera red reaction and
ion should be tested by addition of pure
12 to 18 hour s incubation An agglutination
rum is a strong positive evidence in favour

Agglutination

Agglutination of the isolated vibrio—The colonies on the agar plate should be suspended in 0 2 per cent formol and tested against a standard cholera 'O' serum This serum will agglutinate true cholera vibrio as well as some strains of El Tor vibrio The 'H' element is only present in some strains of true cholera and also in all saprophytic water vibrios The El Tor vibrio may be excluded by testing for the presence of haemolysins in a three day broth culture of the organism For practical purposes the isolation of a non haemolytic vibrio which can be agglutinated by a specific serum containing the specific cholera 'O' (sub group I) antibody can be regarded as diagnostic of cholera

Cholera and food poisoning

Differential Diagnosis—There are many diseases which may be mistaken for cholera and an attempt should always be made to differentiate them Food poisoning and severe gastro intestinal disturbance, occurring commonly in summer, may simulate *cholera In* infants summer diarrhoea may cause symptoms resembling those of cholera Acute bacillary dysentery algid malaria arsenic poisoning meningitis in children and many other conditions in an endemic area have to be distinguished from cholera The history often *helps a differential* blood count *and blood examination should also be done but the* final criterion is the detection of *V cholerae* in the stools

From food poisoning it can be differentiated by paying attention to the following groups —

	Cholera	*Food poisoning*
Onset	With purging	With vomiting
Tenesmus	*Not present*	*Very marked*
Nausea	Not present	Present
Vomiting	Continuous, watery, rarely contains blood	Violent often streaked with blood and mucus
Abdominal pain and tenderness	Rare	Marked and constant. Tenderness all over abdomen
Stools	Early, continuous pouring out of rice water like fluid	Liquid, offensive and faecal may contain blood and mucus
Dehydration	Very marked	May be present in a mild degree
Muscular cramps	Constant and severe	*Less constant*
Urine	Often complete suppression.	Seldom suppressed
Fever	Surface temperature sub normal	Surface temperature usually above normal
Blood	Leucocytosis especially mononuclears increased	No change

Algid malaria may be mistaken for cholera but presence of malaria parasites in the blood smears is helpful

Fulminating bacillary dysentery may simulate cholera but in this straining and tenesmus is a feature and blood mucus *and pus occur in the stools*, there is also the characteristic cellular exudate.

Arsenic poisoning—There is burning in throat followed by violent vomiting often streaked with blood Evacuation is delayed and often a single large stool with blood is passed with marked tenesmus Abdominal tenderness is present, dehydration is slight

(6) Prognosis

The mortality rate varies in different epidemics from 30 to 80 per cent and average is 50 per cent It is highest at the onset of an epidemic In certain parts of India the incidence and mortality of cholera exhibit a marked seasonal variation It is higher in the first and last quarters of the year and lower in the second and third quarters Young children pregnant women aged and debilitated people alcoholics opium addicts chronic nephritics and people with liver and heart disease do badly A severe and prolonged collapse stage uraemic symptoms and hyperpyrexia are unfavourable signs but with modern treatment these can often be avoided

Unfavourable signs are great cyanosis and restlessness with complete failure of the pulse at the wrist and especially in the brachial artery The severity of a case can be estimated from the degree of concentration of the blood a specific gravity of 1066 and over is of grave prognostic significance

(7) Treatment

Urgency of action

(a) General—The disease being a sudden one the patient is usually seen when he is in a distressed or even in a collapsed condition It is important to realise that as soon as symptoms suggestive of cholera appear the patient should lose no time in going to a hospital Medicines given by mouth at this stage are useless The patient should be kept in a horizontal position in a warm bed and the foot of the bed should be raised Nursing is important, a careful recording of the temperature including rectal temperature pulse reporting the number and character of the stools seeing that the patient avoids chills and gets adequate attention are essential to the proper conduct of a cholera case On no account should the patient be allowed to get up to pass his stools but he should be made to use the bed pan In very severe and fulminant cases the incessant use of the bed pan exhausts the patient s strength and a better plan is to put a water proof sheet which can be changed every few hours under the patient and to pack the buttocks with two or three wads of cotton wool It must always be remembered by the attendant that the stools are highly infectious and rubber gloves should be worn when washing the patient or changing bedding Sips of water, soda water or *dab* (cocoanut) water are given frequently to allay thirst Cramps may be relieved by friction and massage of the limbs, or if very severe by a small injection of morphia or even by repeated small inhalations of chloroform Blankets and hot water bottles help to maintain the body temperature during the collapse stage All food should be withheld during the acute stage of the disease but the intake of fluids should be encouraged The course of the disease is so rapid that the successful treatment of patients suffering from cholera entirely depends upon the careful assessment of the varying phases of the disease and the application of rational methods of treatment In no other disease is a closer collaboration between the nurse and the doctor so necessary to bring about cure In cholera the main lines of attack essential to counteract the effect of the powerful toxins of cholera on the body are —(1) To eliminate the toxins formed, (2) to destroy the cholera vibrio and (3) prevent the occurrance of uraemia It is important that treatment should be begun as soon as possible the symptoms should be watched carefully and the treatment be modified as the case develops so that the collapse stage and other deadly complications may be avoided The best palliative method as yet devised for the treatment of cholera is that introduced by Sir Leonard Rogers in Calcutta between the years 1906 and 1915 which most rapidly and satisfactorily replaces the fluids salts and alkalies lost from the body tissues The only specific treatment of cholera which

Elimination of toxins

Rate of Infusion

The rate of infusion should be carefully controlled and should be about 4 oz per minute (or one pint in 5 minutes) as long as the pulse is not fully restored, in this way 4 pints can be given in 20 minutes If in the course of the injection the patient *shows signs of oppression (laboured breathing etc)* the rate should be slowed at once The cannula should be tied preferably in the median basilic vein If the flow is greatly reduced or stopped by strong vasomotor contractions 1 ccm of pituitrin can be given The infusions should be repeated if the pressure is 80 mm or less cramps restlessness and cyanosis are clear indications for repeating the intravenous injections of hypertonic salines If the pulse pressure as represented by the difference between the systolic and diastolic readings is under 20 mm the use of further saline is indicated but an increase of 4 mm in the pulse pressure is an indication for stopping the infusion

During the stage of reaction the temperature of the patient should be carefully *watched and if it goes beyond 103°F sponging with cold water may be* done at once The output of urine should also be measured and if it is less than one pint in twelve hours one pint of alkaline saline solution (bicarbonate in normal saline) should be given and repeated if necessary

In addition to intravenous saline Rogers combined hypodermic injections of 1/120 gr of atropine morning and evening in acute cases of cholera Roger s method of treatment has been favourably reported on by all those who have tried it

Strophanthin 1/250 gr may be given along with the saline and is valuable in sustaining the heart and raising the blood pressure

Along with intravenous salines ½ to 1 pint of the alkaline isotonic saline with glucose should be given per rectum every four hours until 2 pints of urine are passed in 24 hours and they will often be retained and absorbed with much benefit especially in milder cases not requiring injection

Factors which favour the development of acidosis in cholera are the dehydration of the tissues the excessive loss of base in the frequent stools and [illegible]

of large doses of sodium bicarbonate intravenously [illegible] *10 ccm of the molar solution per kilo body weight* has been used The lactate ion is transformed into glucose and the sodium ion liberated combines with the excess of carbonic acid to form a rapid supply of sodium bicarbonate In this way acidosis is overcome without the danger of alkalosis

Anuria

Anuria—This commonly occurs in the collapse stage and should be combated by improving the blood pressure Posterior pituitary extract or pitressin in doses of 1/2 to 1 ccm given subcutaneously 2 or 3 times a day is useful in the reaction stage adrenaline may [illegible] Caffeine citrate in doses of 5 gr has [illegible] well as a diuretic Dry cupp[illegible] with the applications of heat [illegible] pint of normal saline) are re[illegible] judicious use of bland diuretics are helpful

Diarrhoea—If diarrhoea persists during the reaction stage large doses of bismuth salicylate may be given combined with Dover s powder

(c) Relief of toxaemia

Antiserums—Although on *a priori* reasoning antiserum treatment would be the ideal method of treatment in a condition where there is such marked toxaemia the experiments carried out so far have been inconclusive No satisfactory antiserum has yet been prepared

Reaction stage—During the stage of reaction which follows the collapse stage, the temperature of the patient should be very carefully observed and recorded If the patient feels warm to touch by placing the back of hand on the chest and shows signs of restlessness, rectal temperature should be immediately taken Rogers deprecated the use of hot water bottles to collapsed cholera patients as it drains the already greatly diminished blood from the vital centres to the skin thus producing considerable harm He has seen cases revived with saline developing a fatal hyperpyrexia Warmth should only be applied if the rectal temperature is considerably below normal but such cases are very toxic *Toxaemic symptoms*

Hyperpyrexia—If the surface temperature is 103 4°F and rectal temperature is over 104°F, immediate treatment for hyperpyrexia should be instituted Cold sponging ice packs and if necessary enemas of ice cold water should be given Hyperpyrexia is a very grave symptom in cases of cholera treated with salines and necessitates immediate action

Urinary secretion—This should be watched by measuring and recording the amount of urine passed morning and evening and noting secretion in 12 hours Signs of deficient secretion or complete suppression are of very grave significance and should be dealt with immediately (See under anuria) A blood pressure of at least 100 mm is essential during the reaction stage for secretion of urine to occur If it falls below this an intravenous transfusion of one pint of alkaline saline should be immediately given Five ounces of a solution of 25 per cent glucose intravenously are helpful 10 ccm of calcium chloride solution added to the bicarbonate solution may be effective Alkaline saline should also be given per rectum in doses of half a pint at a time

Low blood pressure—Treatment of low blood pressure has already been described The cases in which repeated injections of alkaline saline fail to maintain blood pressure and renal action are difficult to treat In such cases pituitrin and such diuretics as caffiene and strophanthin are helpful

Diet—No food is likely to be assimmilated during the acute stages of the disease and the starvation is generally well borne in ordinary persons In very young and old patients it is advisable to add 2 per cent glucose to the saline administrated both intravenously and per rectum Great care should be taken in starting giving food by the mouth as this may produce diarrhoea To begin with give milk whey followed by clear vegetable soup Such starchy foods as sago, arrow root corn flour etc are gradually added to the diet If the kidney is functioning properly meat broths diluted milk and eggs are allowed

(d) Medicinal

Kaolin or aluminium silicate was first used in the treatment of cholera by Stump in 1906 Walker (1921) advised giving half and half suspension of finely pulverised kaolin in water to drink *ad libidum* with the idea that it will absorb the toxins and so lessen their absorption into the circulation Colic and the tendency to vomit is at once arrested During the World War I dysentery and cholera in the German armies were treated with kaolin Kaolin is sometimes combined with charcoal For vomiting a 2 per cent solution of sodium *Kaolin*

The speed with which the fluid is injected may be fast or slow, namely 4 oz *per minute i e*, 1 pint in 5 minutes or 1 oz per minute i e, 1 pint in 20 minutes

If the rectal temperature is normal the *temperature* of the fluid should be the same If the former is 100°F then the later ought to be 94°F, and if 86°F then 102°F *In this* way the danger of developing hyperpyrexia is avoided

The infusion must be repeated if the blood pressure falls again to 70 mm or under or if the specific gravity of the blood rises to 1063 or over Other *indications* are restlessness, cyanosis, cramps, failing pulse, etc

The repetition of injection depends on the condition of the patient some require one pint in 24 hours while others as many as 50 pints Each *time 1 pint of alkaline solution* must be injected before the hypertonic

Potassium permanganate water, 1 to 6 gr to 1 pint, may be sipped or 2 gr pills every 15 minutes for the first two hours and every *half hour for the rest of the day may be* ordered Kaolin 7 oz (200 gm) in 14 oz (400 ccm) may be given in bowlfuls every half hour

After rallying the blood pressure will go up to 80 or 100 mm Normal saline to which glucose is added may be injected per rectum at the rate of ½-1 *pint* every 2 hours and later every 4 hours until urine is passed freely For the circulation, 10 min adrenaline may be injected intravenously plus 1 ccm of *pituitrin hypodermically* Fifteen grams of urea may be given orally with benefit

(8) Prophylaxis

Quarantine

Of all the quarantinable diseases cholera is the one in which prophylactic measures are of great influence in prevention Theoretically, quarantine should be an efficient protection against the introduction of cholera in to a community, but unless they are stringent and thoroughly carried out, quarantine regulations are of little use Contacts should be isolated for five days from last exposure Quarantine, inadvertently carried out may sometimes actually increase risk of an epidemic, by fostering *a false sense of security and thus* lead to neglect in the observance of domestic, municipal and personal cleanliness and an un*contaminated water and food supply Moreover, in consequence of the* intimate association of a number of individuals in a quarantine station the number of carriers is likely to be increased Cholera in the main is a water borne disease and attempts should be made to ensure a pure water supply All drinking water and all water in which dishes and other articles used in the preparation and serving of food are washed, should be boiled Fruits with thick skin, such as bananas oranges, apples, pears etc, should be disinfected Hands should be

Water can be also made safe by treating it with potassium
sinfection of wells, ponds, etc should
imme Pure water should be cheap and
Flies play an important part in the
l be protected and measures should be
adopted to destroy their breeding place Proper disposal of human excreta is important to prevent contamination of water, food and insects All convalescents should be isolated till their stools are free from vibrios

Experience in the cholera epidemics has shown that great care should be taken *to preserve the general* health Fatigue, chill, excess in alcohol or in dietary should be avoided It must be remembered that the use of purgatives, especially the saline purgatives, may precipitate an attack of cholera in a carrier or those who are liable to attacks *of indigestion*

Tomb used extensively a mixture of essential oils which is made up as *follows* —Oil of cloves 5 min, oil of cajuput 5 min, oil of juniper 5 min aromatic sulphuric acid 15 min and spirit of ether 30 min Half to one dr of this mixture is given in 1 oz of water as a prophylactic measure Once

the disease has developed this mixture is of little or no value and there is some evidence to show that in excessive doses it causes damage to the kidneys and suppression of urine

Vaccination—Vaccines are obtained by suspension in normal saline of the growth of 24-hour old agar cultures and killing the vibrios by heating at 56°C to which 0 5 per cent phenol is added as a preservative In India the vaccine is prepared from a mixture of three to six or more strains freshly isolated from cholera cases during the early parts of an epidemic It contains 8 000 million organisms per ccm In order to ensure full immunisation a sufficient dose should be given The usual method is to give two injections consisting altogether of 12 000 million organisms It is advantageous to use a vaccine which is made from local freshly isolated smooth strains For a single injection 8 000 million vibrios is the usual dose employed but the best recommendation that one can make is to use the strongest dose that can be tolerated without producing an excessive reaction While vaccination by single injection is of some value vaccination by two or even three injections should be the method of choice If three doses are given the first dose should be 0 5 ccm and second and third 1 0 ccm each at intervals of 5 to 10 days preferably one week Some recommend double of this dose but this is likely to produce severe reactions If it is possible to give only one dose 1 0 ccm should be given *Use of vaccine*

Immunity production—The mouse protection test is now used to determine the protective properties of vaccine and its virulence in the same way as in the case of typhoid organism Russell (1927) carried out investigations on a large scale to determine the protective value of cholera vaccination In a series of 8 485 vaccinated persons who received two doses there were 31 cases of cholera with 2 deaths as compared with 40 258 control unvaccinated persons in whom there were 711 cases of cholera with 277 deaths

Statistics show that the total mortality is twenty five times as high in the non vaccinated as in the vaccinated Vaccination by the mouth has also been practised according to the principle enunciated by Besredka (1927) The vaccine is made from a thick suspension of organisms killed by heat carbolic acid or alcohol each dose consisting of 10 100 thousand millions of vibrios contained in a pill is given every day on an empty stomach and usually 3 to 5 doses are employed Russell (1927) made comparative tests of anticholera vaccine and the oral bilivaccine and showed that the effects of anticholera inoculation were superior to the three doses of bilivaccine In a series of 4 962 persons who received three oral doses of the vaccine there were 18 cases of cholera and 4 deaths The immunity only lasts for three to six months and there does not appear to be a negative phase which is important from point of view of mass inoculation in epidemics

Disinfection of drinking water—Chlorination is widely practiced in India and for filtered water supplies one part of chlorine in five million parts of water is sufficient to destroy cholera vibrios and organisms of the enteric group Roughly six pounds of bleaching powder (chlorine containing 33⅓ per cent) are sufficient to disinfect one million gallons of water If chlorine content is lower more has to be used *Water disinfection*

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V. FOOD POISONING

In former years the term food poisoning was used to include a variety of clinical conditions of diverse aetiology The term is now restricted to certain acute conditions characterised by gastro enteritis usually of sudden onset and short duration and attacking a number of persons within a short period of time. Excluding cases in which poison is added to food accidentally or with criminal intent, the vitamin deficiency diseases and the peculiar idiosyncracies of individuals to certain food stuffs (food sensitization or allergy), three classes of food poisoning may be distinguished —(1) That due to poisonous foods, (2) that due to certain *chemical poisons*, and (3) *that due to bacterial infections* or toxic bacterial products In all *these conditions there is acute gastro-enteritis* with vomiting or diarrhoea, abdominal pain and sometime fever, prostration and shock

Poisonous foods

Poisonous foods—In this class may be grouped those substances which are consumed through mistake for wholesome food. Poisonous fungi (mushrooms and toad stools) may be mistaken for edible mushrooms poisonous alkaloids have been isolated from 80 species The tap root of aconite has been substituted for horse radish, children may eat the *attractive berries of deadly night shade Rhubarb leaves are poisonous by reason of their* high oxalate content and even nutmeg may produce toxic symptoms. Water hemlock contains poison in leaves and roots Certain tropical fish gives rise to symptoms of acute food poisoning and apparently sound mussels not infrequently cause illness which has been attributed to a poison, mytilotoxin apparently generated under unknown conditions. Milk from cows which have eaten snake root causes trematal or alkali poisoning which is not destroyed by pasteurization. Sprouting potatoes may cause toxic symptoms due probably to the elaboration by the action of micro-organisms of a poison called 'solanin' The grains of cereals may be attacked by ergot fungus (*Claviceps purpurea*) and cause gangrene of the extremities or nervous lesions Lathyrism is caused by a poisonous substance which has been described elsewhere.

[illegible] es find their way into foods accidentally
l by the presence of arsenic in beer and
ng may arise from the use of soft water
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e is used as a cheap substitute for tin
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1. BACTERIAL FOOD-POISONING

Ptomaines

The conception of food poisoning has undergone considerable change in recent years It was formerly believed that food poisoning was due to toxic *amines called ptomaines*, which appear during the later stage of protein putrefaction but this theory is now discredited Ptomaine bodies are relatively non toxic to laboratory animals except in doses much larger than are likely to be consumed under ordinary conditions. Moreover the ptomaines do not appear till the protein decomposition is so advanced as to make the food quite unacceptable while food poisoning usually results from consumption of food which looks quite normal to the naked eye

Role of bacteria

The term "bacterial food poisoning' is now applied to symptoms of acute gastro
[illegible] gestion of food contaminated with certain bacteria *Many of*
[illegible]

result from the multiplication within the body [illegible] preformed toxic bacterial products. the food or from the consumption of the food containing preformed toxic bacterial products. The former group is known as the "infection' type and the latter as the toxic' type

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The following bacterial agents produce food poisoning —

(1) Salmonella group
(2) Staphylococcus.
(3) Streptococcus
(4) Clostridium botulinum

(1) The 'infection' type of food poisoning

Salmonella food poisoning—The organisms concerned in the production of the infection type of food poisoning belong largely to the Salmonella group but certain organisms of the dysentery group specially Sonne and Flexner bacilli may also give rise to symptoms of food poisoning A large number of the members of the Salmonella group have been incriminated in th s respect but the most common members are —

(1) *S typhimurium* (known also as *S aertrycum*) occurs in mice rats and man
(2) *S enteritidis* (gaertner s bacillus) occurs in cattle
(3) *S cholerae suis* var *kun cadorf* (*S suipestifer*) occurring in hogs
(4) *S schottmulleri* (*S paratyphi B*) & *S paratyphi* A

Morphologically salmonella can be differentiated from other bacteria of intestinal origin They are short rods with rounded ends are actively motile, have numerous long lateral flagella and are gram negative They do not form spores are killed at 56°C but resist long periods of temperature below the freezing point They grow on ordinary media and do not form indole. They ferment dextrose and mannitol forming acid and gas but not lactose and sucrose Each type has a heat stable or O ant gen and a heat labile H antigen contained in the flagella

Salmonellae do not form potent toxins in vitro and it is not clear how they set up gastro-enteritis The inflammatory reaction is probably due to rapid multiplication of bacteria in the intestine in the same way as cholera

Type of food—Meat, unpasteurised milk, cheese fish and eggs especially duck's eggs are generally responsible for the outbreaks Fresh meat is rarely responsible for the ... puddings jell es etc., ... contain *S cholera suis* ... Vegetables and cereals ... to remember that the *Foods involved*

How is the food infected—The meat may be derived from an infected animal (duck pigs) and may be insufficiently cooked or meat from a healthy an mal may be infected during the course of preparation The main sources of infection of food during preparation are rats and mice and human carriers Both rats and mice are frequently infected with *S typhi-murium* and *S enteritidis* and tl e food may be contam nated with droppings of the infected animals It is difficult to estimate the part played by human carriers as real carriers Sal nonella carriers are uncommon but considering the frequency of *S typhi-murium* and *S enteritidis* infection in rats and mice one would expect that temporary human carriers were quite common When viable bacteria of the salmonella group infect the intest ne the infection is of a temporary nature and bacteria soon disappear from the gut Occasionally they produce chronic infect on with persisting ulceration of the colon

Outbreaks are usually explosive in nature and involve nearly all persons who have partaken the contam nated food This differentiates it from shigella infections

The bacteria responsible for producing gastro enteritis produce irritative substances in the food which are not of the nature of toxins but probably substances of rather simple chemical composition wh ch may be the autolysed bod es of bacteria

Cl nical aspects—The incubation period is variable according to whether it is true infection or otherwise. In cases of active infect on the clin cal symptoms last much longer Generally after an interval of 6 to 72 hours of ingestion of food there is violent d arrhoea ... *Symptoms*

[illegible]

When *toxins formed* in the food are ingested, the incubation period and duration of symptoms is shorter Canned or potted meat or fish and milk and milk products such as cream and custard are the *most common articles* of diet responsible for the toxin type of food poisoning But other articles such as pickled or pressed beef or ham or cheese may be responsible

Diagnosis—The diagnosis of food poisoning is made primarily on clinical symptoms. [illegible]

vomitus is much less satisfactory for this purpose. In severe cases organism may be isolated from the blood. In the absence of evidence of Salmonella or dysentery infection, food may be *given to kittens to diagnose* the 'toxin type. *If* bacteriological findings are negative tests for detection of chemical poisons should be carried out

Agglutination tests done with the patient's serum may sometimes give an indirect evidence of the infecting organism in the 'infection type. For this to be of any value it *should be repeated at least twice at intervals of 7 to 10 days* so that a rise in titre can be detected.

Prophylaxis

Prophylaxis—Food likely to have been contaminated should not be eaten and suspicious canned food of every description should be destroyed Excreta of patients should be disposed off in the same way as enteric patients, and all precautions with regard to sterilization of hands, linen bedpans, etc, should be taken The *hygienic precautions to prevent food poisoning primarily* concern Public Health workers A thorough systematic inspection of meat in all slaughter houses is essential It may be stated that cleanliness in the production and handling of food stuffs is an efficient safeguard against many of the infections carried by food, particularly the bacterial ones The diminution of human contact and handling in the preparation of preserved foods, greatly reduce the occurrence of food poisoning as the pathogenic organisms occasionally gain access to the food through the agency of human beings harbouring the bacilli Therefore, persons concerned with the preparation and serving of foods should be brought under observation for medical and bacteriological examination to determine the possible origin, whether from bowel discharge or infections of the skin In respect of certain diseases conveyed by food such as tuberculosis and helminthic infections from meat, naked eye examination may sometimes be helpful to detect the unhealthy stuff This is not, however, useful in cases of bacterial infections of the Salmonella group where the food stuffs apparently look normal *in appearance* unless of course the food is decomposed Methods adopted in the prevention of infection may be roughly stated as follows —

Cooking—Cooking of meat and all other food stuffs is a considerable *safeguard against infection* and if adequate would destroy all infections It must, however be remembered that in some cases the temperature in the interior of the meat *during the process of cooking may not rise sufficiently* high to completely sterilise the food This is especially true of canned foods which may contain living organisms *even after heating to above the boiling point* for an hour or more and several workers have shown that 70 per cent of canned foods are not sterile

Pasteurisation —Adequate pasteurisation seems to be a complete protection against infections present in milk For effective pasteurisation much depends on the adequacy of the process The temperature preferred is about 143°F, maintained for half an hour, if the temperature falls below that, the process will not be efficient After pasteurisation or boiling milk should be rapidly cooled as it has been shown that enormous increase of bacteria occurs during the process of slow cooling in the preparation of ice cream after preliminary heating

Refrigeration —The function of the refrigerator is to retard the growth of bacteria and moulds which find their way on to the surface of meat fish and other food stuffs Cold storage undoubtedly tends to diminish the occurrence of food poisoning and this is especially the case with such foods as sausages and potted meats It should however, be understood that if meat has already been heavily infected refrigeration cannot prevent its rapid decay

Preserved foods —Canned foods are very often not completely sterilised in some cases bacterial contamination may occur after the tin is opened and hence it is always advisable to consume the entire contents the day it is opened The formation of toxic products in canned foods depends in some measure on the length of time that has elapsed between preparation and consumption 'Blown' tins should always be rejected

Treatment —Rest in bed is essential In the early stages whenever possible the stomach should be emptied with some emetic or washed out with normal saline solution For curative treatment measures should be directed towards complete evacuation of the bowel If patient is seen early give a good saline purgative (magnesium sulphate or sodium sulphate) or an ounce of castor oil *Treatment*
If ... value
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cer ... rate
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diarrhœa bismuth salicylate with some astringent may be prescribed Abdominal pain and distension should be treated with turpentine stupes tincture of opium may be given in form of a mixture Colonic irrigations with normal saline have also been advocated in cases of persistent diarrhœa In cases of choleric symptoms and marked collapse subcutaneous or intravenous injections of normal or hypertonic saline should be given rectal injection of glucose in 1/2 to 1 pint of saline is also of value Stimulants in form of brandy are frequently indicated in the collapsed stage If syncope is present injection of camphor subcutaneously may be given No food is generally necessary for the first 24 hours except small quantities of boiled water later peptonised or citrated milk diluted with an equal quantity of water may be given The diet should be gradually increased as the symptoms improve When the symptoms have abated the patient should have liquid d et and return to normal food should be gradual If fever continues treat in the same way as enteric fever

(2) Staphylococcus food poisoning

It has been shown that a number of other organisms when growing under suitable ... s which are h ghly ... isms are ordinarily ... se organisms are ... and possibly some *Sta l ylococci and streptococci*

constriction in the throat and *inability to swallow* (which produces accumulation of food in the throat) severe constipation is the rule Nausea vomiting headache and insomnia occur in many of cases and abdominal cramps rarely occur Extreme muscular weakness *may be felt from the* beginning but is invariably present after the third or fourth day There is no tenderness of muscles Temperature pulse urinary tract mental faculties hearing etc remain unaffected

The patient s face is pale eyelids droop (ptosis of lids occur in 30 per cent), divergent squint is present convergence is difficult and accommodation is partly paralysed The fundus shows venous congestion but the d scs are normal mydriasis occurs in one third of the cases The tongue cannot be protruded fully the palate is relaxed and the uvula droops Blood pressure blood count special senses (except eyes) are normal *The reflexes* are all present and the kerings sign is negative The temperature remains normal

Diagnosis and prognosis

Diagnosis—The symptoms of botulism *are so characteristic that* a diagnosis can be made on clinical grounds especially when cases occur in a group having eaten the same food The diagnosis can however be confirmed by demonstration of botulinum toxin in *the suspected food and by isolation* of the bacillus *from the suspected food* The isolation of the bacillus from the patients fæces or vomit or from the viscera at a post mortem examination is not satisfactory For a rapid demonstration of the presence of the botulinum toxin and the determination of the type of toxin three mice are injected intraperitoneally with a saline suspension of the suspected food Before being injected two of the mice are protected with antitoxin one with antitoxin A and the other with antitoxin B If the control mouse and one of the protected mice die it can be provisionally concluded that the food contains the botulinum toxin and that its type corresponded to the type of antitoxin given to the surviving mouse

Differential diagnosis has to made from epidemic encephalitis poliomyelitis mushroom and belladonna poisoning

Prognosis—If symptoms appear early the prognosis is grave but there may be exceptions The case mortal ty in different outbreaks varies from nil to 100 per cent accord ng to the amounts of toxin present in the food. Toxin of A strain is said to be more fatal than that of the B strain

Antitoxin

Treatment—The prog
in 24 hours and 84 per ce
8th day 20 per cent die
patient should be in bed and the stomach washed out It should be d[illegible] towards (1) neutralization of the toxin with antiserum (2) counteraction of the toxic effects with drugs having an antidotal action, and (3) artificial respiration if the respiratory muscles are paralysed

Antitoxin has been prepared by injection of rabbits, horses and goats with each type of toxin Experimentally it has been found that *30 000 neutralizing* doses given 24 hours after injection of toxin protect a guinea pig It should be given immediately though *it is effective only in mild* cases. A polyvalent botulinum antitoxin (A, B & C strains) should be given in doses of 60 to 100 *ccm* intramuscularly preferably intravenously, 10 ccm should be given prophylactically to all those who have partaken of the food It is better to dilute 10 ccm of the serum with 100 ccm of warm saline before it is slowly infused It may also be given by continuous drip in glucose saline (5 per cent), the serum being added in small quantities at a time As regards dosage there
[illegible] stered *The best plan is to give* 10 ccm
ed As much as 600 to 700 ccm
elikanov and Kolesnikova (1934)
showed that mortality was considerably reduced by use of serum Serum has also been given intrathecally with good results

There are no official standards of potency, but no antitoxin should be used which contains *less than 100 units per 1 ccm* (unit—amount of serum which neutralizes 100 lethal doses of toxin for a guinea pig)

If signs of dyspnoea appear artificial respiration should be started atonce or the patient may be put in an iron lung apparatus

High enema of soap and olive oil has been advocated with the idea that it neutralizes the toxin Iodine and potassium permanganate have also been used for the same purpose Certain other substances have been advocated which are said to delay the action of toxin Morphine is given till a somnolent condition is produced and similarly ether anaesthesia has been advocated with the idea that it will delay the action of toxins on the tissues

These drugs probably help by conserving the waning muscular strength by decreasing voluntary movements Posterior pituitary extract is useful, it acts by restoring the tone of the intestine and in this way expelling the toxic food from the intestines Drugs of the physostigmine group are of no practical utility nor is congo red which is an antidote to curare

DISEASES CONVEYED BY FOOD

Food as source of disease

The bacterial infection of food besides giving rise to symptoms of food poisoning is responsible for conveyance and spread of various diseases caused by bacteria worms and protozoa. Asiatic cholera though conveyed principally by infected water may also be transmitted by milk, butter and raw vegetables Enteric fevers are generally conveyed by contamination of water supply but may also be contracted through the consumption of certain kinds of fish such as oysters milk, ice cream butter, cheese, bread and other food stuffs Scarlet fever is another disease wh ch may arise from consumption of infected milk and occasionally diphtheria may be contracted in the same manner

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uncommon disease among men who handle carcasses of infected an mals Infected meat and foods prepared from meat are common sources of food poisoning due to salmonella infections which have been already d scussed.

Certain protozoal d seases are transmitted through the agency of food stuffs amoeb c dysentery may be transmitted by raw vegetables and balantidial dysentery and giardia infections may also arise in like manner On the other hand diseases caused by worms are transmitted by food alone. Thus *Taenia solium* is derived from eat ng pork, *Taenia* saginata from eating beef *Dibothriocephalus latus* may arise from the consumption of certain fresh water fish and the hydatid disease in man is caused by food or water contain ing the eggs of *Taenia echinococcus*

A question of great importance in this connection is the source of infection of the food stuff It is generally admitted that man alone suffers from cholera enteric fevers bacillary dysentery and in these cases infection arises from fæcal contamination of the food stuffs The infection may either be direct or indirect through contamination of the water supply by an acute or healthy carrier In tuberculos s undulai t fevers sore throat, the source of contamination is usually the infected animals In scarlet fever and diphtheria infectn n almost always arises from a human carrier

CHAPTER V

DISEASES CAUSED BY MYCOBACTERIA

I. TUBERCULOSIS

*(with special reference to India)**

1. General Considerations

TUBERCULOSIS GENERAL CONSIDERATION—EPIDEMIOLOGICAL FEATURES—PATHOLOGICAL CONCEPTS—DIAGNOSTIC PRINCIPLES IN PULMONARY TUBERCULOSIS—CLINICAL LABORATORY PROCEDURES—PRINCIPLES OF TREATMENT IN PULMONARY TUBERCULOSIS INTRODUCTORY, CHEMOTHERAPY OF TUBERCULOSIS DIET—MANAGEMENT OF A CASE OF PULMONARY TUBERCULOSIS—COLLAPSE THERAPY—CLIMATE AND TUBERCULOSIS—CONTROL OF TUBERCULOSIS PREVENTION OF BOVINE TUBERCULOSIS, B C G VACCINATION IN THE CONTROL OR TUBERCULOSIS

LEPROSY CLINICAL AND OTHER ASPECTS—TREATMENT OF LEPROSY TREATMENT WITH HYDNOCARPUS PREPARATIONS PHARMACOLOGY OF HYDROCARPUS OIL AND ITS ESTERS COMPOSITION, SELECTION OF CASES FOR TREATMENT METHOD OF INJECTION, INTRAMUSCULAR INJECTION, SUBCUTANEOUS INJECTION, SUPPLEMENTARY TREATMENT, TREATMENT WITH SULPHONE DRUGS INTRODUCTION GENERAL PRINCIPLES OF TREATMENT, MODE OF ACTION OF SULPHONE DRUGS THE TYPE OF CASES SUITABLE FOR SULPHONE TREATMENT, CLINICAL IMPROVEMENT, BACTERIOLOGICAL IMPROVEMENT TOXIC EFFECTS AND COMPLICATIONS, LIMITATIONS OF THE TREATMENT, ROLE OF SULPHONES IN CONTROLLING THE SPREAD OF LEPROSY, GENERAL PRINCIPLES IN TREATMENT WITH THE SULPHONES, TREATMENT WITH OTHER DRUGS STREPTOMYCIN AUREOMYCIN PARA AMINO-SALICYLIC ACID (PAS) THIOSEMICARBAZONE OTHER REMEDIES TREATMENT OF SOME COMMON COMPLICATIONS TREATMENT OF LEPRA REACTION TROPHIC ULCER

Tuberculosis is a contagious disease, which is communicated to man either by other persons or by animals, a short period of time becomes predominantly localised in one or more organs of the body The causative organism does not remain localised indefinitely, however, except with a quickly healing lesion, but is transferred to other parts of the body through the agencies of the lymph stream the blood and the sputum For clinical and administrative convenience the disease may be considered under two main headings, viz, pulmonary tuberculosis, where the lesions are localised chiefly but not entirely in the lungs, and non pulmonary tuberculosis, where the localisation is chiefly in other tissues of the body

Causative organism —The causative organism was first demonstrated by Robert Koch in 1882 to be an acid fast bacillus which measures 2 5 to 3 5μ in length and 0 3μ in thickness It belongs to the genus *Mycobacterium* Not all acid fast bacilli are pathogenic The following belong to the pathogenic group of acid fast bacilli (1) *M tuberculosis human*, bovine and avian types (2) cold blooded types in fish, frogs, snakes and turtles (3) *M paratuberculosis* causes John's disease in cattle, and (4) *M leprae*-causes leprosy Saprophytic acid fast bacilli are found in smegma, hay, cow manure, butter and human ear wax Acid fast bacilli, belonging to the genus *Mycoplana*, are also present in soil

As regards *M tuberculosis*, the human, bovine and avian types produce disease in man, The avian type is rarely met with in man The human type is more common in man and the bovine type more common in cattle The avian, bovine and human types of tubercle bacilli cause disease in other animals, e g fowls, cats, dogs, swine, sheep, goats, horses, camels, monkeys, etc. Contrary to the general belief, goats do develop tuberculosis and, therefore, the milk from these animals is not without danger, cattle, hog and other animals can be infected with human tubercle bacilli from intimate contact with consumptives and from

* This chapter has been contributed by Dr A C. Ukil

eating infected garbage Man can get bovine tuberculosis from intimate association with diseased cattle and from consuming unsterilised infected milk. In countries where cattle tuberculosis is common, as many as 50 per cent of cases of lymph node tuberculosis, 50 per cent of lupus cases, 25 per cent, of cases of tubercular meningitis, 20 per cent of cases of osteo-articular and genito-urinary tuberculosis and 1 6 per cent pulmonary tuberculosis have been found to be caused by the bovine type of tubercle bacillus. In India, non-pulmonary lesions have been found to be almost invariably caused by the human type of tubercle bacilli. The possible causes are —(1) rarity of tuberculous lesions of the udder and of generalised tuberculosis in Indian cattle, probably because of their open-air life and probably because infected cattle from other countries have not been imported into India in large numbers, and (2) the invariable practice with Indians to boil the milk they drink.

The mutability of the human bacillus into bovine and *vice versa* as a result of long residence in the tissues of the host of the other species is a question which still remains unsolved

Modes of infection in human tuberculosis The bacilli can gain entrance into the body (1) by inhalation of droplets expelled by "open" cases of pulmonary tuberculosis through coughing, sneezing, and loud speaking at a distance of approximately 3 feet or of dust containing sputum and other infected discharges deposited on the floor, walls, furniture, clothes, books etc, (2) through the ingestion of food, drink or other material contaminated with tubercle bacilli, (3) by inoculation into the skin or mucous membrance, and (4) by placental infection, which is extremely rare. Hereditary transmission through sperm or ovum has been practically disproved.

The chance of infection increases in proportion to the want of care in the disposal of discharges and the absence of sunlight to act on them It has been observed in India that direct sunlight kills the tubercle bacilli in sputum, when spat outside dwellings in places exposed to sunlight, in about 6 hours' time. In such circumstances, the risk of dust borne infection outside sheltered places in this country is not great In sheltered places, however, the bacilli remain alive and virulent, according to the degree of darkness, lack of ventilation and dryness of the atmosphere, for several months.

Infection and disease —Tubercle bacilli are not ubiquitous They are found where animals or persons have the disease, i.e, they are found chiefly in the environment of the contagious cases of tuberculosis A brief contact of a healthy animal or man with a tuberculous one is all that is necessary to transmit the infection

Tubercle bacilli are fairly resistant to heat and desiccation They may remain alive in rooms for months under ordinary conditions The air in room of a patient with 'open' pulmonary tuberculosis may contain a sufficient number of bacilli to infect a guinea pig by inhalation The bacilli are killed by sunlight quickly, by heating to 60°C for half an hour in milk and by mixing an equal quantity of 5 per cent carbolic acid to sputum in 24 hours

Factors in infection Infection depends on several factors, viz, (1) the virulence of the tubercle bacilli introduced into the body, (2) the dose or the number of bacilli introduced simultaneously into the body, (3) frequency of infections, (4) the path of infection i. e., whether through susceptible tissues or not, and (5) the sensitivenss of the individual. The quantity of microbes introduced is more important than their virulence A single big dose is more dangerous than small repeated doses, as in the former case the organism does not get an opportunity to develop immunity

A child at birth is not tuberculous It is by contact with contagious cases that children begin to get infected from a few months after birth. In isolated communities and in rural areas, the infection rate is less than in crowded communities The incidence of infection is greatest in *homes where close contact* with infective cases prevails It is thus seen that one generations is constantly sowing seeds for the next

The *first or primary infection* takes place chiefly through the respiratory and alimentary tracts By whichever route the bacilli gain entrance into the body, they soon travel through lymphatics to the blood stream Thereafter phagocytes engulf the bacilli, go out of the circulation and deposit themselves in various parts of the body The brunt of the insemination falls on the pulmonary tissues and hence lesions are more common in the lungs. Within a few weeks to several months, according to the dose and frequency of infection, the tissues of the host become sensitive or intolerant to further introduction of bacilli or their proteins *This increased sensitivity can be elicited by introducing small doses of tuberculin*

Mantoux test The best known test is known as Mantoux test, which is done by the intracutaneous introduction of certain doses The incidence of reaction varies according to age, closeness, frequency and duration of contact with an infective case and isolation or crowding of communities For details of the test and its interpretation, the reader is referred to the Report of the Tuberculosis Survey Committee, Indian Research Fund Association 1940, pp 37-41

The primary lesion produced by the first infection fortunately heals in a *majority of cases, but the regional glands remain as reservoirs of bacilli for many* years In infancy chiefly in tuberculous households, the bacilli often escape into the circulation and may cause death from meningeal tuberculosis, which accounts for 15 per cent of the total mortality from tuberculosis in *London No reliable* record are available in India to give us an idea of deaths from meningeal tuberculosis in infancy

Development of disease. The development of disease seems to depend on (1) an inherited or group resistance, acquired through generations of contact [illegible]

habits anxiety, incidence of other preventable diseases, [illegible]
diag[illegible] [illegible] and rehabilitation etc

cour[illegible]

wide distribution with [illegible]
as wars etc.), (3) high incidence among certain groups or in particular localities, and (4) recommencement of epidemic where contact with infection has been lost

2 Epidemiological Features

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as compared [illegible]
per cent in the more advanced western Eu[illegible]
high in most parts of the *country* The clima[illegible]

social customs and habits that may help the spread of tuberculosis are the joint family system of living (which leads to overcrowding), partial seclusion of women in homes (more so among Muslims), early marriage and frequent motherhood, careless spitting, and eating and drinking from common vessels

Cattle population—Although the density of cattle population is high, only 2 to 3 per cent of cattle slaughtered in abattoirs show glandular tuberculosis, udder tuberculosis is extremely rare Indian milch cattle living in sunshine and open air have been found to be more resistant to fatal doses of bovine tubercle bacilli than English milch cattle Drinking boiled milk is the invariable practice Seventy strains of tubercle bacillus from pulmonary sources and 221 strains from non pulmonary sources isolated and typed out in India have been shown to belong to the *human* type. Except in one instance in which the case history was not known, 120 strains from nonpulmonary sources and 17 from pulmonary sources studied by workers in other parts of India have given identical results It is significant to note here that only 5 per cent of cases among 1,000 consecutive autopsies in Calcutta showed primary intestinal tuberculosis and that a similar figure has been quoted in some other parts of India.

Infection rate—The distribution of infection and disease in India presents a complex

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r than among urban people The course of the disease on the whole is acuter and is more rapidly fatal than in western Europe.

Industrial areas 70 3

The incidence in well isolated rural areas away from rail routes was as low as 21 per cent The extremely low incidence among infants and children, viz., 11.4 per cent between 0 and 5 years and 30 1 per cent between 6 to 20 years is noteworthy In the presence of a source of infection in the home, the incidence 71.4 per cent between 1 and 5 years

were living in the same room with an

present moment varies between 21 in

The mingling of rural populations

ike the Gurkhas, Bheels, Khonds and

sents a complex picture of hypersensitivity and resistance among the infected people The smaller towns and industrial centers serve very often as the meeting ground for the diffusion of infection and disease

Morbidity figures—It is difficult to get accurate figures of morbidity in any country, because of, (1) defective laws of notification and noncompliance with the same, (2) wrong information supplied by patients or their relatives for fear of the stigma associated with the disease, (3) wrong diagnosis due to a variety of causes, and (4) lack of education and medical facilities in the country concerned

trialized towns of India.

Duration of life

The duration of life of a person with pulmonary tuberculosis, which depends on the infective dose, the age, the extent and multiplicity of lesions the secondary bacterial flora in "open" cases and on *the resistance factor* of the individual is distinctly shorter in India than in western Europe Furthermore, *it is shorter in females than in males*, Pregnancy, prolonged lactation, diabetes influenza, and kala azar have been found to shorten the course A large-dose infection on an *imperfectly immunized soil* seems to operate in a large majority of the cases, as 54.5 per cent of patients attending tuberculosis dispensaries give a *history of contact with a previous case*.

It has been noticed that both the pulmonary and *the non pulmonary form of tuberculosis* in India attain the maximum age incidence 5 to 10 years earlier than in western Europe The prevailing type of lung tuberculosis in rural and semirural areas shows exudative changes, with very fragmentary attempt at localization. Histological study of pulmonary tissues and radiological studies in India indicate that only *5 to 10 per cent of* cases exhibit any marked tendency to fibrosis while the remainder show varying degrees of exudative changes, and as many as 40 to 50 per cent show a marked extension of the disease to both lungs within a short time Naturally, where a tendency to localization is poor the cavities generally show soft walls Anglo Indians and those who have been born and brought up in western countries, when other factors causing hypersensitiveness are excluded

The question whether secondary bacterial associations in open pulmonary tuberculosis cases *influence in any way the evolutive processes in a hot climate* is also *worthy* of attention. The secondary bacterial flora (aerobic and anaerobic) appears to be richer and more varied in India than in western Europe, and that, apart from the ulcerative processes, it either augments the virulence of tubercle bacilli or aids their growth and multiplication

Mortality records—Deaths in tuberculosis during the first 2 years of life are mostly due to circulatory dissemination Meningitis causes 15 per cent of the total deaths at this period The initial peak of mortality in most advanced countries is due to this But this peak is not discernible in Indian figures owing to non detection of cases because tuberculosis mortality is double that of general mortality in children and 3½ times in adults in the tubercular homes in Calcutta.

Mortality figures are notoriously defective in India. From recorded figures it appears that there are 600,000 to 1,000,000 deaths in a population of 350 million every year the highest mortality figure next only to that of malaria Tuberculosis mortality in larger municipal areas forms 15 to 20 per cent of the total deaths.

No definite figures of mortality from the different types of nonpulmonary tuberculosis are available in India, *chiefly because of defective classification, diagnosis, and notification.*

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wns and industrialized areas e.g. at
eloped industrial towns of India the
English towns of the same size and
ee of tubercular infection is associated
contact with the disease in the course
agricultural countries.

As regards the influence of *race* on morbidity and mortality it is now believed that tuberculosis is not a racial problem One human race or group when it encounters the
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Climate and solar radiation—The infection rate is low among the population of the mountainous regions of India where transport facilities have not yet been well developed When these people come to the plains and remain in contact with the better immunized population or when transport routes are carried to them, the incidence of disease and deaths from the acuter types of illness increase For example, in the Darjeeling Hills in excluding that in Calcutta, thought to be detrimental tuberculosis

een found to be richer in thermal and chemical properties than those in central and western Europe for which we possess figures It seems paradoxical that in such a country tuberculosis should spread so quickly Most of the infection therefore seems to take place in sheltered places i e, in homes and working places. It is significant that lupus is a comparatively rare finding in the dermatology section of Indian hospitals.

3. Pathological Concepts

There are three phases in the response of the body to tuberculous infection —

(i) *State of indifference* —This corresponds to the period of incubation. This period after the first infection may extend to weeks or months or even years depending upon such factors as the number of bacilli their virulence and the frequency with which repeated infections take place whether from endogenous or from exogenous sources During this stage phagocytes engulf the bacilli and carry them through lymphaties to the nearest lymph nodes, where they are hemmed in by cellular barriers or counteracted by the production of antibodies

(ii) *State of intolerance* —During this state the tissues of the body acquire a

and signs, by X-ray examination and by certain blood tests, such as the estimation of the lymphocyte monocyte ratio, Von Bonsdorf count and sedimentation rate of erythrocytes

In the case of break into a bronchus and the contents get opposite lung setting up new foci where If the infected contents escape into a ses in other parts of the body and may cause generalised tuberculosis Thus while mild reactions are beneficial in controlling the minimal damage, severe inflammatory reactions due to excessive liberation of toxins cause progressive disease

(iii) *State of tolerance* —If the production and absorption of toxins is minimised, the necrotic processes stop and the reparative processes continue ultimately leading to a healing of the lesion. The object of treatment is not only to reduce and control the inflammatory reactions extent as to stop tissue but also to level that severe

The anatomical characteristics of the first infection or primary focus, when met with in the lung is a small exudative focus (miliary broncho pneumonia) exhibiting rapid caseation and the bacilli soon drain into the regional lymph glands inducing inflammation and caseation there This pulmonary glandular complex is known as *primary complex* The pulmonary component gets quickly encapsuled and calcified in most cases but the glands take a much longer time to do so The lung is the site of primary complex in 90 per cent of cases The primary complex may, however, in a smalled number of cases show progression resulting in extension of the parenchymal focus with excavation and intrabroncheal spread

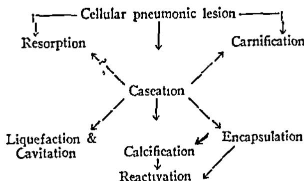
or to rupture of a caseous lymph gland into a bronchus and produce an aspiration bronchopneumonia

All post-primary lesions are produced on an allergic soil and they exhibit the characters of well known Koch's phenomenon, with a tendency to necrosis and excavation with their subsequent sequelae Its limitation to one-organ and the chronicity or otherwise of the disease depend on immunobiological responses of the body tissues Intra bronchial spread and cavitation are features of progression, whereas resorption and fibrosis are those of retrogression. *Extensive radiographic surveys are bringing into light a type of lesion, rarely* more than 1-2 cm in diameter, usually located in the subclavicular region, in which symptoms are so slight that often they go unnoticed This may be a feature of either a primary or a post-primary lesion They occur more frequently in young adults

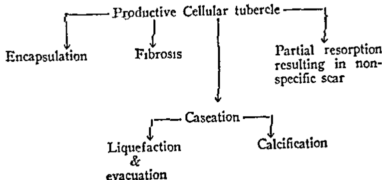
The response of the host to different factors residing in the tubercle bacilli manifests itself either as *exudative* phenomena (in which the cells of inflammation and constituents of plasma infiltrate tissues without replacing the normal tissue) or as *productive* phenomena (in which the new-formed granulation tissue consisting of various types of cells displaces the normal time) In most cases, either the one or the other predominates In Indian cases, 5 10 per cent exhibit any marked tendency to fibrous tissue proliferation, while the remainder show verying degrees of exudative or mixed changes The onset may be acute or insidious according to the degree of response of the tissues to the absorption of tuberculo-toxin.

The possible developments of the exudative and productive changes may be indicated as follows (after Max Pinner) —

Exudative Reaction:



Productive Lesion:



Productive Lesion:

These changes which are roughly represented on the roentgenogram of the affected part of the body can be interpreted in terms of the clinical phenomena of the disease

4. Diagnostic Principles in Pulmonary Tuberculosis

In the child —Tuberculous disease in infancy and childhood occurs mostly in those reared in a tuberculous environment It is the result of primary infection and may be

The difficulties of timely diagnosis are increased by the fact that the symptoms of
The first important
osure Next, we are
d less severe than in

The diagnosis should be clinched on a commonsense consideration of a multiplicity of minor symptoms and signs, local and constitutional The history of exposure having been taken first, a weakly pale child with capricious appetite and failure to thrive, with perhaps some fever, anaemia and cough, ought to be looked on with great suspicion A *careful* physical examination may show a flat chest or visible veins or enlarged supraclavicular glands on inspection. Dyspnoea and stridor may be caused by tracheobronchial adenopathy Sero fibrinous pleurisy, especially in the mammary region, is frequently present and should be looked for

The Mantoux test should always be done and, when positive, corroborative X-ray investigation is essential Skiagraphs of the chest, including one in the lordosis postion (to elicit or exclude interlobar pleurisy) should be obtained and studied. Laboratory examination of pathological materials, including the examination of centrifugalied deposit from stomach wash for tubercle bacilli should be done.

In 1920, Eliasberg and Neuland described a type of large usually lobar, shadows in

condition.

In the adult —Mass radiographic surveys of apparently healthy groups of population indicate that somewhe
significant foci in lu
health in a slight an
the patient being aw
progressive phthisis

The earliest symptoms, such as unexplained afternoon fatigue, poor appetite, chronic

elsewhere

In order to do this, adequate X ray examination is an essential requirement, as otherwise we are likely to *miss* 50 per cent of the cases Having ascertained the presence of a lesion in the lung, the next thing is to *determine* whether the lesion is active or not. In presence of symptoms referable to the pulmonary focus, the character *of lesions* on the

roentgenogram and the finding of tubercle bacilli in sputum laryngeal swab and gastric contents (including concentration method and culture or guinea pig inoculation) should clinch the diagnosis Inspection, palpation and percussion gives an idea of the area involved, whereas anscultation gives an idea of the quality of pathological changes in the lung,

In recent years, increasing evidence of tuberculous tracheo bronchitis has been noticed. Apart *from their coughproducing effect*, which contributes to bronchogenic spread they interfere with aeration and drainage from stenosis of the involved bronchi. The common symptoms are distressing cough causing intrabronchal dissemination retention of sputum causing *increase of toxaemia, wheezing and dyspnoea* due to atelectasis and restrictios of the available bre [illegible] ... pressure in the area whi [illegible] leads to the fo [illegible] these changes [illegible] examination is [illegible] collapse theraphy

5. Clinical Laboratory Procedures

The demonstration of tubercle bacilli in discharges is the final proof of the tuberculous origin of a lesion. Hence the methods of examination must be careful and approved. In this connection a reference may be made to Appendix II of the Report of the Sub-Committee on unification of pulmonary tuberculosis Tuberculosis Association of India 1940 PP 12-14.

Sputum, laryngeal swab and Gastric contents —A proper examination of the sputum and centrifugalised gastric lavage material helps not only in establishing the diagnosis, but in assessing the progress of treatment and prognosis

At least 3 seperately collected samples should be examined for direct smear examinations If these samples are negative a reliable Concentration method should be used. In order *to obtain reliable results the method of collection of sputum is as important as the method* of examination. At least 200 microscopic fields should be surveyed in a carefully prepared smear

Where direct sputum or *laryngeal swab* smears are negative culture by an approved method gives 40 per cent more positive results Gastric specimens should preferably be cultured It should be remembered however that even with all methods combined, not *all specimens containing tubercle bacilli are found positive. In recent years fluorescence* microscopy has been proved to be superior, to Ziehl Neelsen staining technique The same techniques can be used in the case of pathological materials other than sputum, *laryngeal swab and gastric samples.*

Haematological Studies —Blood examinations which are of most use in the treatment of tuberculous patients are the sedimentation test and the Leucocyte count. Neither is of much help in diagnosis but both when frequently repeated are of real use as a guide during treatment and also in prognosis when the diagnosis has been established

There are several methods of doing the Sedimentation Test, depending on the amount of blood taken the proportion of blood and citrate solution and the time of reading the test Westergren's technique is the simplest and most widely used. A definitely elevated sedimentation rate indicates some pathological progress important or unimportant, tuberculous or non-tuberculous

The leucocyte counts include an absolute count, a differential count, a count which takes *into consideration* the differentation of the neutrophiles and the ratio between lymphocytes [illegible] with a decrease in lymphocytes is [illegible] value in differential diagnosis, some [illegible] osis Index. Among these three are [illegible] nd Barton's, in assessing prognosis [illegible] r is again referred to the Report of [illegible] of India, 1940, PP15 18

The examinatio [illegible] puncture in meningeal tuberculosis is essen [illegible] nical examination leave 10 ccm for bacteric [illegible] high protein value and low sugar content [illegible] For the bacteriological examination Petroff [illegible]

Add 2 drops of 5% tannic acid solution to 10 ccm of C.S fluid Shake thoroughly and centrifugalise Decant the supernatant fluid Use one portion of the sediment for

smears, one portion for culture (pyogenic organisms and T B) and one portion for guinea pig inoculation, if desired.

In intestinal localisations a particular type of "filling defect' in ileo-caecal region following a barium meal is essential to observe both by fluoroscopy as well as by serial skiagraphy

It is no longer enough to day to diagnose a case of pulmonary tuberculosis as such but to exactly locate the seat of disease whether a lobe or lobes segment or segments, situated anteriorly or posteriorly, or in the larger air tubers. With regard to the lungs,

has been applied

6. Principles of Treatment in Pulmonary Tuberculosis

(1) Introductory

The behaviour of the tis ... n explained under
the section Pathological ... hat the allergic
intolerance to re-infection ... xudative reaction
mostly around the seat of tl ... which is akin to
the inoculation of a large d ... individual may be
manifested by such symptoms as lassitude, fever loss of appetite and weight, cough and
expectoration, ... of infection.
When mild, th ... closing the
lymphatics and ... The degree
of intolerence ... gns (2) by
studying the c ... ind cated by
graded tubercu ... of tolerance
when ... as a general
... r and size of
... e erythrocyte
... in with the
establishment of tolerance

It has already been said that the toxins produced by the increased number of tubercle ... they give rise to the various ... es The greater the amount ... the absorption of toxins By ... assuring perfect physical and ... the affected portion of the ... Mechanical difficulties due to the elastic recoil of pulmonary tissues and adhesions around lesions can often be removed by the application of suitable operative procedures At every step however the development of a helpful psychology and spirit of cooperation on the part of the patient goes a great way towards recovery

The first essential in treatment is therefore to reduce, minimise and control the excessive inflammatory reactions due to hypersensitiveness on the one hand and on the other to stimulate these reactions to such an extent as to stop the spread of disease and to convert the existing foci into solid scar tissue, as also to aim at raising the threshold of tolerance to tuberculo-toxin to such a high level that severe reactions from re-infections are avoided.

Temperature is one of the best guides in the treatment of tuberculosis Fever indicates intolerance due to excessive liberation of toxins from lesions which circulate throughout the body The liberation and absorption of toxins can be minimised to a great extent by enforcing absolute physical and mental rest. Any physical movement or mental excitement increases the action of the heart and the circulation of blood through the area of the

lesions, thereby leading to an increased absorption of toxins. Absolute *rest in the recumbent* posture using bed pan and urine bottle i e, bed fastness is indicated when there is fever But if this rest regime is enforced much longer than it is necessary to cope completely with auto inoculation enough tuberculo *proteins would not circulate in* the body to produce antibodies and immuno allergy, to raise the threshold of tolerance and to bring about the mild focal reactions essential for the production of scar tissue. The determination of the *moment when the movements* are to be commenced and the manner of their regulation require great care and watchfulness The moment there is an indication that too much toxins have gone into the circulation to cause intolerance the movements are to be stopped *until* the body has been able to cope with the excess amount of toxins set free

The basic principles of treatment in tuberculosis consist, therefore *not in rest* alone nor in exercise, but in graded rest and graded exercise in the right proportion in each individual case. All other remedies and procedures are only adjuvants, although some of them are so important that in *many cases no improvement can be expected without applying* them

Exudative types of cases particularly in young adults require a longer period of initial rest regime than in cases where fibrous tissue proliferation is predominant. An initial bed fast rest regime of 8-12 weeks of continued normal range of temperature before a patient is allowed graded movements is essential

Temperature taking A few words about *recording of temperature are needed here* First, test the thermometer you are using It should be compared with a reliable thermometer several times a year Having obtained a good thermometer, choose the method of *taking the temperature keeping in view the daily range of temperature in a healthy* individual Axillary temperature is extremely unreliable in a warm and humid climate such as prevails in most parts of our country Oral temperature is more reliable but, in order to have a dependable record, the thermometer should be placed under the tongue with mouth shut, for 5 7 minutes. The normal range is 97-98 F in the morning rising to 98-98 6F between 2 6 p m and gradually receding towards midnight. The patient should be told to avoid mental excitement physical movements or eating and drinking of hot food or drink before recording the temperature During the first week or so take the temperature on rising in the morning and thereafter every 4 hours until bedtime and thus determine the time of lowest and highest temperature Thereafter instruct him to take the temperature only at the peak periods which are usually at 6 A M (or on waking) and 6 P M Resting oral temperature above 98 6F should be considered as higher than normal and should be treated as evidence of intolerance to tuberculo-toxin, unless otherwise explained. Rectal temperature keeping the thermometer for 5 minutes in rectum is more *accurate but many patients may not like the method* The normal on waking is 97.4 to 98 F and may rise to 99-99 5 F in the evening say about 6 P M There is a normal pre menstrual rise of temperature by a degree or so in women. The above remarks hold good even in *the case of so-called half minute thermometers*

Grading rest & exercise A few words about the grading of rest and exercise be found to be useful here It should be remembered that our aim is usually to take a patient from the resting febrile (=toxaemia uncontrolled while in bed) stage to a Working afebrile (=toxaemia controlled when working) stage It must be remembered that it takes some months to cover the distance It is necessary to explain the full implications to the patient and to secure his faithful cooperation After the temperature has remained consistently normal for 8 12 weeks according to the nature of the case add movements very gradually and try out their effects for 10-15 days for each set of movements in order to find out that they do not bring about any intolerable absorption of tuberculo *toxins* First let him sit up in bed for two hours in the day If this is tolerated allow him to sit in a chair next to the bed for 2 hours a day morning and afternoon insisting that he should be in recumbent posture in bed for 2 hours after the mid-day meal and *should lie down in bed for the night* by 9-30 P M If this is tolerated, he may be allowed to go to the bath room if it is a contiguous room for purposes of micturation only once in 24 hours When this is tolerated allow him to go to the bathroom more than once but not to take *his bath himself yet When he can help* himself with the bathroom, ask him to take slow walk once daily for 5 minutes If this is tolerated make it twice daily Five minutes slow walk is equivalent to walking a furlong Slowly increase the movements until the patient can tolerate 2 miles walk *twice daily Clinical examinations (to elicit* the number and size of rales over the lesion), if everything goes on well need not be made oftener than once a month Blood sedimentation rate and chest skiagraphy may be done once in six weeks, in order to corroborate *or otherwise the clinical findings.*

Temperature Record If the patient is taught to keep his temperature records according to the following scheme, it will be a very helpful guide for the physician to advise him :—

Date	Morning			Evening			Amount of movement or exercise permitted for 10-15 days.	Remarks
	A	B	C	A	B	C		

A = *Resting temperature*, i.e. Temp on waking in the morning or after two hours' rest in bed following midday meal.

B = *Exercise temperature* i.e. temp taken immediately after the movement or exercise permitted for 10-15 days at a time.

C = *Post-exercise resting temperature*, i.e. temp. taken 20 minutes after the patient has remained quietly recumbent in bed.

N B The temperature at B may record slightly higher than normal. If the amount of exercise has been tolerated, the temperature at C should record 98.6F or lower If it remains higher than 99F oral one should understand that the amount of exercise has not been tolerated. In order to allow the allergy of the tissues to settle down, the patient should be asked to suspend walks for a few days and then recommence at a lower scale. It is essential during the grading of exercise that the patient should have complete rest in bed for one hour after the morning and evening exercise and for two hours after the midday meal If the exercise is tolerated an all round abatement of symptoms, such as cough anorexia, loss of weight and fatigue, signs such as reduction in the number and size of rales and even their disappearance, improvement in X ray appearances and blood indices. Of all the indicators for improvement, gain in weight is the least dependable

In a favourable case, it takes 9 months to one year to stabilise the improvement of [illegible] essment [illegible] needed [illegible] rabilita- [illegible]

Tuberculous tracheo-bronchitis A few words on this important subject which is connected with several aspects of treatment, will be found to be useful Recent experience has focussed attention on the diagnosis and correct evaluation of tuberculous lesions in trachea and bronchi When present, they not only produce increased cough and thereby contribute to bronchogenic spread but, what is more serious interfere with aeration and drainage from inflamed, oedematous or ulcerated mucous membrane and often cause stenosis

Interference with aeration is indicated by one or more of the following findings — Obstructive emphysema ballooning [illegible] sudden changes in the size o [illegible]

Common symptoms of intra bronchial tuberculosis are —excessive cough sputum retention (leading to toxaemia) pain dyspnoea and wheezing On physical examination, dulness or hyper resonance, evidence of shrinkage of lung tissue such as retracted thoracic cage

with narrowed interspaces and mediastinal retraction high pitched bronchial breathing and sonorous rhonchi may be found Additional signs and symptoms may develop owing to the production of secondary changes

The permanent blockage of a major bronchus is extremely rare but stenosis is relatively frequent In the presence of bronchial stenosis, two factors may prevent the beneficial effects of collapse thereby uncollapsible tension cavities and impaired drainage leading to secondary infection and suppuration. Bronchoscopic examination of a case of pulmonary tuberculosis with cavity has thus become a routine measure for diagnosis

(2) Chemotherapy of Tuberculosis

Gold therapy There is no specific remedy for tuberculosis either chemotherapeutic or biological Since the concluding years of the last century innumerable agents bacterial ... without success Twenty years ago certain gold ... *Their alleged benefit was supposed to be derived* ...ial system and hence they were in the category ...rative and destructive character of tuberculous ...herapy, *partly because they are irreversible and* ... drug to the micro-organism The patient's own resistance is a prime factor in recovery, except perhaps in tuberculosis of the kidney brain and meninges The chemotherapeutic agent is at best, a valuable adjunct to and not a substitute for other accepted forms of treatment Chemotherapy should never be used as a temporizing measure but should only be used as a part of a programme designed to produce arrest or cure of the disease

In recent years extensive trials have been given to (1) certain sulfone (related to sulphonamides) compounds such as promin, promizole and diasone which have been found to cure an impressive number of treated guineapigs but have proved to be too toxic in human cases (2) antibiotics, of which two are well known, streptomycin and neomycin both derived from soil fungi

Streptomycin Streptomycin, supplied either as the hydrochloride sulfate or calcium chloride double salt, has been the most widely used antibiotic in recent years It is readily soluble in water In sealed ampoule the powder is stable at room temperature for many months and even in solution there is no loss of potency for two months or more *It is* ...oute also intrathecally in meningitis cases locally in ... application in lesions of the upper respiratory tract, ...*antages are however its high toxicity* and drug ... such as disturbances of vestibular function (vertigo ...natitis usually appear between the third and seventh ...hey last for a few days to few weeks or may last ...erly people in whom deafness may be permanent ...*h proportion of cases of pulmonary tuberculosis, the* ...*action and remain permanently so*

...after two or three weeks' treatment more ... In both in this country and in Europe ...omycin resistant tubercle bacilli ... given at the same time as strep... is seen here in pulmonary tub... in intra... of PAS

Two of these have been given fairly extensive ... sodium salt discovered by a Swedish investigator named Lehman in 1946 It is now generally supplied as the sodium salt It is given by the mouth as a 20 per cent solution in tap water It has an unpleasant taste *like that of salicylates which it is difficult to* disguise It is usually given in adults in 3 gm doses four times a day or a daily dosage of 12 gm for 5 days in the week, either given alone or in conjunction with streptomycin in pulmonary *tuberculosis As regards toxicity* nausea, vomiting diarrhoea or flatulence and more rarely skin eruptions are seen in a small proportion of cases, which disappear

on stoppage of the drug or a reduction in its dosage As regards drug resistance a small number of cases has been reported but the matter is still under investigation. In general, PAS is a less potent drug than streptomycin Improvement in pulmonary tuberculosis is slower than with streptomycin, but as with streptomycin recent active disease responds best Miliary and meningeal tuberculosis are unaffected Its toxicity becomes less evident if alkalies are given simultaneously 5 to 10 per cent sterile solutions have been used intrapleurally in cases of pleural effusion or empyema The results however, are not impressive.

Streptomycin and PAS The possibility of a combination of two anti microbial agents which might prove more effective because of synergistic action and which might also delay

but not beyond 90 days

(b)
series disc
Conteben
action is
inactivatec
'fresh ex
In miliary
obtained b
daily for
can toler
are anorexia anaemia dizziness, palpitation, purpura, photophobia, conjunctivitis and blurred vision, erythema and cerebral oedema As the drug is a liver poison the diet should be rich in protective foods The urine and blood should, therefore be examined from time to time

Benefit of streptomycin limited From what has been stated above it will be seen that streptomycin has a limited but important place in the therapy of certain types and stages of tuberculosis In general, streptomycin should be withheld if other satisfactory treatment such as bed rest, pneumothorax or chest surgery alone or in combination is likely to meet the requirements of the case The immediate benefits of streptomycin are usually limited to a period varying from several weeks to at most 3 months It is extremely important therefore, that the period of streptomycin therapy should be fitted into an overall plan of treatment, which frequently include collapse therapy and institutional care *It should in no case be considered as an alternative to recognised methods of treatment* It should usually be reserved for cases where healing under medical management is to be expected or for making cases fit for surgical therapy, and should not be used in cases which are already inactive localised or improving Its chief field is in the control of scattered areas of exudative processes of moderate extent and of recent origin but not in cases with heavy pneumonic consolidation The presence of cavities has been found to favour the development of streptomycin resistance It should therefore, be cautiously used in well selected cases Where applicable it should always be used concomittantly with PAS or Tibione PAS or Tibione given alone is less effective than streptomycin but both given together give somewhat better results Streptomycin is a weapon to be used in a crisis, whether in an acute exacerbation or in preparation of an operation Such a trump card should not be used indiscriminately which may be more usefully employed at a later stage Streptomycin is of course imperatively indicated in otherwise fatal forms of the disease such as meningitis and miliary tuberculosis.

Types of cases which are likely to be benefited by streptomycin is given below —
(1) Tuberculous meningitis and acute or subacute miliary tuberculosis, as has been stated are absolute indications

Miliary Miliary tuberculosis needs sustained treatment for at least 6 months The recovery rate varies between 30-50 per cent. In tuberculous meningitis both intramuscular and intrathecal therapy is needed. For intrathecal injection 0 05 to 0 1 gm should be given dissolved in at least 5 ccn ... with C S fluid during infection after ... Intrathecal administration should be mac ... of spinal fluid has been withdrawn, 10 c ... en minutes

For children under three a dose of 0 05 gm should not be exceeded and the usual dose may be 0 02 gm per day or 0 05 gm every other day Treatment must be continued for six months or more The survival rate varies between 25 30 per cent

(ii) *Pulmonary tuberculosis* —(a) As has been stated, streptomycin is *mainly effective* in recent exudative types of the disease It is useless in chronic fibrocaseous disease and tuberculous cavities are seldom closed It is therefore recommended that at present streptomycin should be used only in cases in which the disease is too acute or too extensive for collapse therapy *with a view to effect sufficient improvement for rendering collapse* therapy to be made relatively safe It should always be combined with PAS or Tib ne The collapse should be instituted while the patient is still under treatment or soon after wards It is dangerous to finish a course of streptomycin and leave the patient with *enclosed cavities as in that case he is likely to relapse* within a short time *It is* not indicated in minimal or early cases It is not also indicated even in moderately advanced cases which offer a good prognosis on conventional treatment. Prophylactically it may be used before such operations as lobectomy pneumonectomy and cavernoustomy It may also be used as an adjuvant to thoracoplasty if pulmonary spread" occurs after the operation.

(b) Recent haematogenic or bronchogenic spread—is likely to be benefitted.

(c) Chronic fibro cavernous types—here nothing but temporary improvement is expected

(d) Ulcerating lesions of the mucous membrane such as oropharyngeal laryngeal tracheal and bronchial and in tuberculous enteritis the results are good. It is however less *effective in granulomatous and still less effective in diffuse inflammatory lesions It is ineffective in purely cicetrical lesions Both local and systemic treatment may be resorted* to where applicable

(e) Pleural empyemata of recent origin and turbid primary or secondary (to pneumothorax) effusions—results are disappointing even where employed both locally and by the systemic route

(iii) *Primary tuberculosis*
It is futile to use streptomycin in primary tuberculosis There is no evidence that it has any effect whatsoever on this cond tion

(iv) *Tuberculous peritonitis and pericarditis*
It is probably of value in controlling the acute process

(v) *Tuberculous lymphadenitis*
May benefit the acute process but results are temporary In cases where the glands have broken down streptomycin if used, should be combined with surgery

(vi) *Genito urinary tuberculosis*
So long as surgery is not contemplated or applied it may produce favourable res l . n —(i) active ulcerating renal lesions too small to be demonstrated by

(vii) Draining tuberculous sinuses and fistulae—as an adjunct to si lab e su gc y may produce considerable benefit

(viii) Tuberculosis of bones joint and cartilage—probably of some value as an adjunct to surgical therapy

(ix) Skin and ocular tuberculosis
Sufficient experience has not yet been obtained and results seem to be uncertain

Re treatment—is possible and feasible if the organisms remain *drug sensitive and the* disease continues an unfavourable course But it should only be undertaken when the sensitivity tests are carried out

It is clear from what has been stated above that chemotherapy of tuberculosis should not be undertaken lightly and that their indiscriminate use should be avoided Unjustified use may not only harm the pat ent but the community as well by the emergence of drug res stant strains of tubercle bacilli

Tuberclum A few word about tuberculin may be useful here Since its advocacy by Robert Koch in 1 90 it has been much abused in the therapy of tuberculosis The commonly used tuberculin test (Mantoux s) helps us to distinguish between infected and non infected

individuals with certain exceptions which need not be gone into here. When positive, it indicates that the person reacting to it harbours specific tuberculous tissue Whether or not such a person has got clinical tuberculosis must be determined by other more reliable methods but it is sometimes needed to differentiate between mere infection and active disease by graded tuberculin test in order to rule out or not tuberculous disease

In therapy however, it has a very limited application In most cases of active pulmonary tuberculosis it is dangerous to use it Desensitization may be applicable in small productive lesions in middle aged or aged individuals where slight evidences of toxaemia are discernible on over exercise, but it should be used very cautiously Similar remarks apply to glandular and osteo articular tuberculosis

(3) Diet

It has been whown that inadequate food intake especially of biological proteins is one of the indirect causal factors in tuberculosis Although it is true that the caloric requirements of a febrile tuberculous patient is greater than those of normal persons it is a mistake to think that if a patient gets stout and fat, it will help to cure the disease The great amount of fatty tissue in over weight patients causes an unnecessary strain on the heart and thus weakens the natural resistance of the body The gain in weight is prognostically of far less importance than the signs of improvement indicated by radiological appearance and blood tests Extension of disease may even occur concurrently with increase in weight The dieting when most successful should produce a gain in weight of not more than 10-15 lbs above the patients normal weight in relation to his height. If it increases more a reducing diet has to be prescribed

Over feeding is as bad as underfeeding Adequate balanced food in relation to the weight of the patient is all that is needed By estimating the basal metabolism of bed fast cases it is seen that such patients do not require more than 2500 calories a day The food should be so selected as to admit of an adequate quantity of biological proteins (milk,

of the season)

of laryngeal

Hermansdorfer,

ould be simple

An improve-

7. Management of a Case of Pulmonary Tuberculosis (In the Adult)

As treatment must be adapted to the particular phase of disease and the resistance presented by the patient our first duty after having diagnosed the case, is to ascertain the epidemiological background and rate of

the nature and extent of involvement and

of intolerance to tuberculo toxin, the statu

bronchial ulceration, nature and extent of

of the patient.

Our next task will be to explain the prognostic implications of the findings to the patient and to secure his cooperation in the measures to be taken for his recovery and rehabilitation The objects of treatment are —(1) To lessen hypersensitiveness from overdosage of tuberculotoxins and to turn the balance in favour of immunity As has been explained earlier, rest of the body

of the area of infiltration and the appearance of fibrous tissue proliferation, closure of cavities and disappearance of T B in sputum (2) To improve the general resistance of the patient by balanced nutrition and improved metabolism An environment with fresh cool air free from dust helps to improve metabolism (3) To raise the threshold of tolerance to tuberculo toxin by graduating rest and exercise so that severe reactions from excessive absorption of toxins or from re-infections are avoided The principles of this measure have been explained earlier (4) To consolidate the improvement gained by the above methods by proper after care and employment, so that the patient is saved from worry, want and social insecurity Physicians and institutions should understand that this is a part of treatment and cannot be safely relegated to the patient or friends Relapses are often due to neglect to observe this principle. (5) From the patients and community

point of view—to render a sputum—positive case into a negative one, as ascertained by repeated culture of the sputum for T B

If strict bed rest *does not* bring about reduction of temperature to normal, consider the applicability of chemotherapy provided there are indications for its use If the sputum shows T B, the most appropriate method of collapse *therapy should* be considered The physician must all the time try to bring about a helpful cooperative attitude on the part of the patient. The *treatment of certain* symptoms and for complications needs attention, especially in the initial stages of management

Cough In dry reflex cough, instruct the patient to take repeated shallow breaths or to divert his attention to *something else If he* is a smoker, advise him to stop it so long as cough persists When non productive cough is disturbing try a linctus such as follows —

Syr Codeine phosph one dram, Syr Pruni Serotinae 30 minims Oxymel Scillae 20 minims, Syr Tolu one dram Sig one teaspoonful in an equal amount of water as required Or an inhalation such as follows —

Syr Codeine phosph one dram, Syr Pruni Serotinae 30 minims, Oxymel Scillae 20 minims Syr Tolu one dram Sig one teaspoonful in an equal amount of water as required. Or an inhalation such as follows —

Chloretone 20 grs, Menthol 10 grs, Parolein one dram To spray into throat and larynx *through an Atomizer Or*

Menthol 10 grs, Oil Cinnamon 5 minims Creosote 2 drams Spt Chloroform 30 minims Sig 8-10 drops on a Burney—Yeo mask every hour and inhaled.

If the bronchial secretion is sticky, try a dose of the following mixture in a cup of hot water at the begining of a paroxysm —Sodii Bicarb 10 grs, Sodii Chloride 3 grs, Spt Chloroform 5 minims, Aq Anisi add one dram In severe cases it may be necessary to give some form of opiate, but it should not be encouraged because it diminishes cough reflex

Haemoptysis Only a very small percentage of cases are immediately fatal by exsanguination or asphyxia Against exsanguination no method of treatment is applicable in time or effective Collapse therapy may be considered in some cases Cases of large haemoptysis may be due to rupture of an aneurism

In other cases, haemoptysis may be small or moderate, on a single occasion or recurrent. The physicians's first duty [illegible]
in the mind of the patient [illegible]
not to talk loudly and to [illegible]
a few doses of bromides [illegible]
cough reflex and leads to [illegible]
often with further spread of disease

In some large, moderate or recurrent haemoptysis, collapse therapy, especially artificial pneumothorax, is indicated but it should be borne in mind that it may interefere with the proper emptying of the bronchial tree

The administration of haemostyptic drugs, like Coagulen, Calcium gluconate etc, although freely resorted to, is not justified on scientific grounds or as a result of experience

Tuerculous enteritis The physician has to be alert in making an early diagnosis of intestinal tuberculosis If in a known case of pulmonary tuberculosis, slight digestive symptoms are present, and particularly if the patient does not continue to improve or gets worse, the possibility of its existence should be considered. A careful study including stool examination and barium meal investigation may help in clearing up the position.

The prognosis has greatly improved by the discovery of the bacteriostatic drugs, like streptomycin and PAS Apart from this, the general principles of treatment will be rest in bed, a high calorie high vitamin and low residue diet, and carefully controlled radiation therapy Pneumoperitoneum may be needed in a certain number of cases A fuller account of the subject is given in The Early Diagnosis and Treatment of Intestinal Tuberculosis (Indian Medical Gazette, Vol LXXVII, no 10, 1942)

Diabetes and Tuberculosis In tuberculous patients above the age of 30 years particularly among vegetarians and among those with a familial predisposition, the urine (3 hours after a meal) should always be examined for the presence of sugar Even if negative, the blood sugar should be estimated. When mild, dietetic adjustments may control the

ondition When well established, insulin therapy has to be resorted to As diabetes with uberculosis is an unfavourable condition early detection and early collapse therapy should e aimed at A tuberculous patient should not be allowed to have uncontrolled diabetes

Kala azar and Tuberculosis This is also an unfavourable combination Kala azar, when detected, should be treated by stilbamidine which has no irritant action on tuberculous foci n the lung Antimonial compounds usually have a deleterious effect on tuberculous lesions.

Pregnancy F young woman
sap out the resist of labour the
sudden descent o ded burden of
responsibility wo i unfavourable
outcome Opinion is more or less agreed that pregnancy in a woman with an active and exudative lesion should better be avoided If circumstances justify and if the husband and wife agree pregnancy may be terminated within the first three months The operative trauma of terminating a pregnancy later is far too great to warrant its performance If the patient is already under treatment or the lesion has productive characters and if the lesion is controlled pregnancy may be allowed to go on provided the mother is anxious to have a child But in the interests of the health of the child he should be forthwith isolated from the mother and given B C G vaccine Pregnancy should, however, be spaced in these cases

8. Collapse Therapy

Collapse therapy has to be assessed on the base line of results achieved by bed rest, which still remains the foundation of phthisis therapy whether or not combined with chemotherapy and collapse therapy when properly applied, has curative effect far beyond any other known treatment. It is not our purpose here to deal with technical details but to lay down certain general principles which may guide the principles of some of the commonly applied forms of therapy It is desirable that the general practitioner should have some background of the developments rapidly taking place in the line One year's special training leading to the Diploma in Tuberculous Diseases has now been introduced in several of the Indian universities.

Collapse therapy should be considered (but not necessarily done) in all cases of progressive lesions cavitation or failure to improve on bed rest and chemotherapy alone. In presence of any of these indications collapse therapy should be started in the absence of contra indications

The first obvious choice for collapse therapy is artificial pneumothorax except in a small number of cases where primary selected thoracoplasty may be a better choice in some upper lobe lesions The increasing applicability of other methods of treatment and the drawbacks of artificial pneumothorax when used in cases other than suitable have led to a more cautious use of this method of treatment, such as pneumoperitoneum partial thoracoplasty resection etc in recent years Pneumothorax treatment should not however be conducted, where arrangements do not exist for intra pleural pneumolysis A technically unsatisfactory pneumothorax or contra selective pneumothorax is a greater danger than no pneumothorax Inefficient pneumothorax should be abandoned in favour of a suitable operation The present status of pneumothorax has been aptly stated by Chaves in a recent issue of the Bulletin of the N T A (May, 1950) and we make no apology in quoting it below —

Status of pneumothorax "In recent years there has been a rather steady decline in the use of artificial pneumothorax in the treatment of pulmonary tuberculosis This was an inevitable occurrance in the history of a treatment which at the height of its popularity was characterized by frequent and serious complications and a lack of uniformly good results

Other factors that have contributed to the decline in popu arity of pneumothorax include the gradual realization of the treatment s limitations the development of newer surgical techniques the resurgence of pneumoperitoneum the ever increasing popularity of thoracoplasty and the introduction of anti microbial therapy (streptomycin and PAS)

Of late the reaction has probably gone too far and for this reason, the present status of pneumothorax is worth reviewing

Indications and Contra indications Cases for A P The type of case best treated by artificial pneumothorax *is one with the following characteristics*

1 The disease should be limited predominantly to one lung

2 A small cavity should be present which is not too longstanding and which has not responded adequately to a reasonable trial of bed rest either alone or combined with *anti microbial therapy It* is essential that tubercle bacilli be demonstrated in gastric washings and sputum prior to pneumothorax induction

3 There should be a minimal amount of exudation and *caseation in the surrounding* tissues

4 Bronchoscopy should not reveal extensive disease of the bronchial tubes

Artificial pneumothorax is the treatment of choice for this type of case. The more extensive the area of destruction the greater the extent of caseation, the more fibrotic the cavity walls, the less liklihood there is that pneumothorax will be successful It is in cases with extensive tissue destruction or thick walled fibrotic cavities that one sees a large number of relapses after re expansion of a mechanically successful collapse of several years' duration Such cases are preferably treated initially by thoracoplasty or resection, as indicated

[illegible]

The presistence of severe bronchial disease however, [illegible] indications for pneumothorax therapy

[illegible]

Adequate collapse of the diseased part of the lung by pneumothorax is [illegible] by pleural adhesions If after adequate study including thoracoscopy when indicated, these adhesions are found t[illegible]mothorax promptly If the adhesions are thin, [illegible] with an otherwise suitable pneumo thorax the [illegible] closed *intrapleura[l]* pneumonolysis In most c[illegible] first month or two after induction whether *pneumothorax is to be abandoned as ineffective or continued* with or without cutting of adhesions Today there is little justification for taking undue risks *to sever adhesions It is probably safer in such cases to abandon the* pneumothorax and attempt another form of therapy

Management of Pneumothorax Care in A P Careful management requires

1 Proper spacing of refills to maintain optimal collapse without too much fluctuation Too much collapse is unnecessary and dangerous, too little is ineffective.

2 Fluoroscopy prior to each refill

3 Withholding administration of air until manometer readings definitely indicate that *pneumothorax needle is in pleural space.*

4. Avoidance of positive pressures

5 Avoidance of puncturing the underlying lung

6 Scrupulous aseptic technique for each refill Careless and complacent attitudes occur all to frequently during the long period of treatment

7 Proper coordination with antimicrobial therapy Just how to use anti microbial agents in combination with pneumothorax is a matter for individual *consideration* We are still learning how to combine these two forms of therapy

8 Adequate bacteriological studies of gastric washings or sputum These are indispensable aids in determining the status of the disease in the collapsed lung

9. Abandonment of the pneumothorax at the proper time

An effective uncomplicated pneumothorax should be continued for three to four years following clinical evidence of *cavity closure It may* be that a shorter period will suffice *There is little justification* for a longer period

If the following conditions prevail pneumothorax is best abandoned —

1 Persistence of cavity after an adequate trial—two or three months—of a techni ca ly successful pneumothorax

2 Increase in size of cavity under collapse.

3 Development of a large pleural effusion

4 Rapid obliteration of the pleural space by adhesive pleuritis

Complications —The most important complications of pneumothorax include —

1 Pleural fluid which when thickened and heavily infected, is called empyema This is the most dreaded of all the complications

2 Inexpandable lung due to bronchial disease contraction of the lung by scar forma tion or thickning of the pleura overlying the lung

3 Diminution of pulmonary function following re-expansion. This occurs to some extent in every case and is related to the degree of pleural reaction. Unfortunately, this is a sacrifice the patient must make for treatment by pneumothorax

4 Air embolus due to accidental injection of air into a blood vessel

These complicat ons can be kept at a minimum by close adherence to the principles already outlined The threat of complications in properly managed pneumothorax is not nearly so great as many physicians seem to think. During the era of its abuse when indications were too broad and ineffective collapses needlessly prolonged, pneumothorax received an extremely bad reputation in some quarters that is not easily forgotten But those of us who use pneumothorax today are uniformly impressed with the present in frequency of empyemas and other serious complications Even when complications do develop they can be treated much more successfully than in the past, thanks to anti microbial agents and improved surgical techniques

In treatment of tuberculosis physicians are influenced to a cons derable extent by personal experience It is understandable therefore that many of them with vivid recollec t ons of the past would rather use alternative methods of therapy in those cases for which pneumothorax is recommended However as the future indicates more clearly the precise
ity amongst chest
of pneumothorax
an important tool
opment of drugs
the host against
ved lung will no

After care A successful pneumothorax has to be continued for 2½ to 3 years or more according to the nature of the lesion and the rate at which cavity closure reversion of sputum status and retrogression of lesions leading to cicatrisation take place This should be followed by the phase of *after—care and rehabilitation*

Rehabilitation This implies that the patient must have financial protection during all phases of his disease. The subject of rehabilitation is a relatively recent development and its full implications are not yet realized in India. It consists of the physical hardening of the patient, development of a hopeful attitude of mind making the patient fit for such work as w ll not endanger his health and of finding a job for him in which either with his previous training or training newly acquired, he can be economically independent. The fullest cooperation of employees is needed in operating any scheme successfully Rehabilita tion is achieved only when the ex patient is in optimal physical condition and well established in su table work. It is cons dered as a part of treatment now-a-days

Many x cases are now dealt with by other
methods (renic paralysis pneumolysis pneumo-
peritoneu therapy is now being perdormed in
about hal favourable influence on the disease

Thoracoplasty Of all the collapse therapy procedures none has so completely established itself as thoracoplasty which secures an effective and permanent collapse in about 70% of cases Thoracoplasty is usually applicable to cases of chronic disease with cavitation wh ch has failed to respond to other forms of therapy where the general physical condition is satisfactory and where there is no active lesion in the contralateral lung In tension cavities and broncho-stenosis following A.P thoracoplasty is becoming the more

approved procedure. In order to ensure success, the pre-operative, operative and post-operative care arrangements as well as those for follow up physical therapy must be satisfactory

Temporary crushing of the phrenic nerve, including the accessory *phrenic, is indicated* in —(1) in certain lower lobe lesions, with or without pneumo-peritoneum, (2) in A.P where upper segment adhesion prevents safe cauterization and where thoracoplasty is not a practicable procedure, and (3) sometimes after abandoning A P It should be remembered, however, that paralysis of diaphragm *is not achieved in* a large number of cases

Pneumoperitoneum—Although opinions vary, therapeutic pneumo peritoneum, may be regarded as an useful and simple procedure in the treatment of certain types of pulmonary *tuberculosis It is produced by* the instillation of air through a needle into the abdominal cavity, which raises the diaphragm and brings about relaxation of pulmonary tissues This is a simple procedure, is relatively safe and is well tolerated by most patients It can often be successfully employed when bed rest a'

is lesion with
(4) cavitary
(5) certain

Pulmonary resection—When pulmonary tuberculosis is strictly limited to one segment or one lobe or one lung the removal of such tissue is now being resorted to more and more. Its main present-day indications are as follows —(1) where thoracoplasty has failed to effect cavity closure and sputum conversion, (2) marked bronchostenosis with suppurative changes, (3) localised tuberculous bronchiectasis, (4) tuberculoma (5) large isolated lower lobe cavity, and (6) active disease unfavourably located in the apical segment of the lower lobe, or in the paravertebral gutter, or against the mediastinum

9. Climate and Tuberculosis

Climate as such has probably no curative action on tuberculosis but suitable climates which help the patient to live with comfort and to improve his hygiene—dietetic regime and the reparative processes better than in regions less suitable The combined action of the various factors in climate complex stimulates the surface of the body and the working forces of the human machine, particularly with regard to its food intake muscle tone and the intake and output of energy The climate in higher altitudes improves the digestion and appetite, improves the gaseous exchange, increases haemoglobin and red blood cells *reduces fever and generally leads to a diminution of sputum* and the number and size of râles in the diseased area in the lung The lower the altitude, the less the tonic effect on the human organism

Since ancient times a favourable climate has been extolled in the treatment of tuberculosis But since the introduction of anti biotics and surgical methods it is occupying a much less important place than previously The application of modern methods of treatment and intelligent medical guidance are more important than climato therapy alone The great majority of our patients must fight the disease in their home surroundings as no country has yet been able to accommodate all their patients in institutions located in a suitable climate Where, however the patients can afford it or where arrangements exist the results of treatment are undoubtedly better in suitable cases

Dry and cool air ... better than cool but moist and still air This stimulation ... drier regions than in the plains in most of the ... mates are depressing and debilitating and as a ... ne up the vital forces as well as a cool drier ... be a valuable adjunct to ... Excessive dryness and

Seaside resorts need protection from rain bearing winds High rainfall and humidity have adverse influence

In the plains the choice of a site needs well-drained and porous soil with moderate humidity and low rainfall and protection from strong rain bearing winds

Sunlight, coolness dryness barometric stability moderate temperature variations humidity and rainfall and protection from strong and rain bearing winds (which bring about congestion of the diseased pulmonary tissues and retard healing) are some of the important points in the choice of a site

Altitude hospitals are called Sanatoria The altitude may be low (900 to 2,000 ft), medium (2 000—4 000 ft.) and high (4 000—6,000 ft.) *Sanatoria*

The suitability of climato-therapy at various altitudes Institutions in the plains and on the sea side.

The ideal spot for a consumptive is a country district where there are no extremes of heat and cold where there is abundant sunshine where the house is on porous soil where the atmosphere is dust free and not subject to sudden barometric fluctuations and where there is protection from strong and rain bearing winds Such a place is very difficult to find in any country but the best that is available in each country should be selected. The patient should be placed in the environment where healing can best take place

[illegible]

contraindication for altitude therapy (f) vagotonic patients

Climate occupies a secondary place in rapidly evolutive cases

Cases unsuitable for high altitude sanatorium treatment (a) acute or rapidly evolutive cases, miliary tuberculosis pulmonary tuberculosis in very young children (b) advanced and cases with high temperature and pulse rate and extreme emaciation and anaemia

[illegible] case of recurrent heomoptysis and rapid pulse rate not treatable by collapse therapy (g) sympathetico tonic patients asthmatics and patients liable to frequent bronchial catarrh and (h) where an emaciated patient has to undertake a long and tiresome journey particularly motor journeys to reach the sanatorium

(i) *Altitude*—The most suitable altitude for Indian patients has been found to be between 3 500—4 500 ft above sea level

(ii) *Location*—It should be close to the area it serves and be easily accessible by railways and main roads The motor route should not preferably exceed 10 miles from the nearest railway or steamer station This is important not only for the health of the run down tuberculous patients but also for the transport of building materials It should not be near a town or factory or high road, as dust and smoke from these places may cause 'useless' cough in patients But here should be one or more towns *at some distance* for providing outside recreation on facilities and for the availability of nursing and menial staff

(iii) *Climate*—(a) absence of extremes of climate both diurnal and seasonal
(b) a moderate amount of rainfall preferably not exceeding 70-80 inches a year
(c) it should be protected against rain bearing winds For example, in Bengal against monsoon winds which generally proceed northwards from the Bay of Bengal Hence any site in the Darjeeling Hills from which the plains are visible is likely to be unsuitable For the purpose of sheltering the site there should be at least 500 ft. of hill above the proposed site protecting it from the rain bearing winds of the plains The direction and movement of clouds along valleys have also got to be taken into consideration The velocity of the prevailing wind should not exceed 10 miles per hour

(d) an atmosphere free from dust, smoke and mist. It should have an abundant sunshine and moderate humidity
(e) adequate supply of safe drinking water, sewage and power arrangements.

(iv) *Soil*—should be dry and porous to ensure good sub-soil drainage.

(v) *Orientation and building area*—Gentle slopes are necessary for buildings, the construction of paths for graduated walks for patients and for supervision. The gradient of the land should not exceed 1 in 8 or 10 to enable the construction of gently sloping paths at distances not exceeding 50 yards

Approximately ½—1 acre of land is allotted per patient. Besides, there should be plenty of space for expansion The site should offer a pleasant outlook area in order to cheer up the minds of patients by a pleasant natural scenery

(vi) *Food supply*—the area should offer facilities for cheap and wholesome food, particularly milk, fish, meat, eggs and fruits

(vii) *Evaluation of criteria*—The following percentage valuations are given to the various factors referred to above —Building area and orientation—20, Transportation—20, Protection from rain bearing winds—10, Surrounding development—10, Utilities (water sewage, power)—10, Annual rainfall—8, Outlook area—8, Outside recreation facilities—8, Sunshine and humidity—6

(viii) *Construction*—Cottage vs multi storeyed type of buildings The need for having wide verahndans on either side. Floor area per bed—90 sq ft. for one bedded ward, 80 sq ft., for multi bedded ward *Beds should be 4'-6" apart Height of the ceiling should be 9-10 ft*

10. Control of Tuberculosis

On thing must be remembered in preventing the spread of tuberculosis. Long before the tubercle bacillus was discovered, an appreciable decline in tuberculosis mortality took place in England by improving the standard of healthy living In the absence of a specific drug for curing tuberculosis it has been found that the reduction of disease and mortality will follow if we can ensure for every individual adequate and healthy living conditions, adequate nutrition, freedo[illegible] and sensibly and profitabl[illegible] the State, the employers [illegible] countries are now on the [illegible] experience a many sided [illegible] ing which other countrie[illegible] industrial civilisation.

The objects of a complet[illegible] (2) to detect tuberculous dis[illegible] all persons suffering from tub[illegible] possible time (as the cost of [illegible] disease is detected), and (4) [illegible] patient.

Thus in any scheme of prevention, one has to think of two things—(1) to create a healthy environment whereby the chances of getting the disease are minimised and (2) to *take care of those who are already diseased* and are likely to infect others

The creation of a healthy environment requires proper education, the improvement of economic status and the launching of extensive *housing schemes* by the State and Local Bodies As regards the second requirement, we must start where the story begins i e in infancy and childhood when the seeds are first inseminated for adult phthisis with which most of us are familier, is but a fruition of the seedling germinated in earlier years

Extensive research and investigation in many countries have shown *that the most* successful results in rehabilitation of the diseased and in prevention have been obtained by a tripartite attack, in which the component parts are interlinked, as follows —

(1) *Early detection case finding education and prevention of infection through, what is known as, the DISPENSARY OR CLINIC SYSTEM*

The functions of a Tuberculosis Dispensary or Clinic are not only to examine, diagnose and advise patients, but also to trace out contacts, especially children, through its Health

Visitors in the homes, at school or elsewhere and to examine, isolate and guide them

This institution therefore, occupies a front position in the organisation for combating tuberculosis in a given area and is the centre for preventive work

In urban areas Tuberculosis Dispensaries may be established having their own staff under a Medical Officer either full time or part time So long as whole time Officers cannot be appointed, competent local practitioners may be given special training and induced to

able there.

In rural areas on the other hand, with scattered and less developed communities, the organisation of separate Dispensaries devoted solely to tuberculosis work may be

existing dispensaries on one or more
tutional beds in industrialy backward
the Tuberculosis Dispensary or Clinic
to the Tuberculosis Dispensary or

Clinic, are useful for patients requiring observation for a day or two or for minor surgical treatment, but patients should not ordinarily be retained in such beds for more than a week.

tuberculosis

The site for a Tuberculosis Dispensary should be selected with a view to its being of the greatest help to the population which it is intended to serve This will be in, or as close as possible to the most thickly populated area of the locality No conditions need be laid down with regard to the distance of a clinic from inhabited houses in or near a populated area if the clinic is properly conducted. If a section of a building which is used for other purposes is selected for a Dispensary, the Dispensary should have its own separate entrance.

Owing to the small number of beds available for tuberculosis cases in general hospitals and special tuberculosis institutions in most industrially backward countries *Domiciliary Treatment* must perforce be resorted to in a majority of cases for many years to come In home treatment and care of patients and their families the Health Visitor and the care Committee play an important part The organisation of open air shelters in the neighbourhood of congested areas, where the patients can be kept by day, may be usefully tried.

(II) *Taking care of those who are more seriously ill and isolating cases who are sources of contagion to the community in special* HOSPITALS AND SANATORIA Although this is one of the most effective methods of preventing the spread of the disease,

A large city may maintain its own Tuberculosis Sanatorium or combined institution (Hospital Sanatorium) with an after-care adjunct but generally Sanatoria should be organised on state or provincial or even on divisional basis

(III) AFTER CARE *of imperfectly recovered substandard lives aimed at restoring their working capacity, by teaching and offering them suitable wage earning vocations* and, if possible, by making them live in special INDUSTRIAL SETTLEMENTS where both

work and cure can be made available This part of the scheme also includes the placement and re-employment of arrested very nearly recovered cases

The first is often known as the FOUNDATION SCHEME the second as INTERMEDIATE SCHEME and the third as the FINAL SCHEME but there is no hard and fast line between them In fact the moment we begin to work in an area we are at once faced with the need for the other two schemes It has been found most convenient to begin with the FOUNDATION SCHEME

The loss to the community through each tuberculous *person is quite high In England*, it is £150 a year 26% of this loss is due to the working days lost 33.4% in time lost, 16.2% in the cost of *Sanatorium and hospital treatment* and 0 4% in sickness benefit charges

Institutional care of the tuberculous *is the most expensive feature of the entire* programme for the control of tuberculosis It has proved to be however one of the most effective measures in *preventing the spread of infection* and in limiting the duration of the disease as well as in restoring the patient to full or partial working capacity

Cost of beds —In India the cost of construction ranges *from Rs 1 000 to Rs 2000/* per bed and the cost of maintenance ranges from Rs 2/ to Rs 3/ per bed per day according to the geographical *location of the institution In the U S A the construction* cost of modern institutions averages 3 500 dollars per bed and the average daily maintenance *cost (1934) at 2.44 dollars per patient per day* It has been found that the earlier the treatment is instituted the lower comes the cost of hospitalization and the better it is for personal and community health The optimum size of a sanatorium is 250 beds for which a Medical Superintendent, a deputy medical superintendent 3 assistant medical officers and a pathologist besides nurses and other staff are needed.

Institutional beds must provide for taking care of early and moderately advanced cases far advanced cases osteo articular and glandular cases besides care colonies Industrial settlements and preventoria The proportion of beds should be 75 for pulmonary to 25 for non pulmonary cases The provision of occupational therapy is an essential component of ... t is estimated that 120 beds are needed for ... hospital and sanatorium treatment in Ind ... untries provided patients are admitted in ... the bulk of the patients here belong to ... f this 78 5% of stage I cases 29 6% of ... *ge and 54% of cases have been known* to ... e

The administrative provisions for the control of tuberculosis require the employment of suitable technical personnel and supervision of schemes which are financed by the Government local bodies insurance societies or private agencies In England, the Government contributes 50% of approved expenditure for the diagnosis and treatment of tuberculosis

Organisations for the control of tuberculosis have developed differently in different countries In Europe both in England and on the continent there are non official Tuberculosis Associations in most communities but they are generally designed either to provide relief for a limited clientele such as through the National Health Insurance Scheme, or to supplement and complement the specific programme of some Governmental agency where as in the United States governmental participation and leader ship in tuberculosis work *operate to a comparatively small extent* The non-official associations are primarily responsible for pointing out the need for service and stimulating the public purse to provide for *the participation of official agencies in the tuberculosis campaign*.

No tuberculosis programme even one of comparatively small scope can succeed without a legislative foundation Legislation, based on facts and science is the only conceivable basis *for the unified control* of tuberculosis Legislation, as affecting matters of public healt ... s of two kinds—(1) intended to secure the money for the prop ... work, and (2) ... nfection from ... ogether for a common purpose Educat ... nployers and other agencies makes the *application of legislation smooth*

The Public Health Act *should include special* provisions for tuberculosis Legislative provisions for the isolation and treatment of tuberculosis usually remain a dead letter unless social insurance is in operation and *institutional beds can be* provided for Administrative legislation may follow this

Prevention of Bovine Tuberculosis

It is estimated that about 40% of cows in England and Wales are affected with tuberculosis and that 3% are capable of infecting the milk. It has already been said that India is fortunate in respect of the small number of infected and diseased cattle. But lack of vigilance on her part might produce a serious situation at any time. Tuberculin tests should therefore be periodically done over all parts of the country especially in the case of imported cattle. Besides encouraging an open air life for cattle and sterlising milk and other dairy products the following measures which have been successfully applied in other countries for the eradication of bovine tuberculosis may be employed according to the financial status of the countries concerned —(1) isolation of new born calves to tuberculin free herds (2) destruction or isolation of all cattle which react to tuberculin, and (3) prevention of export of diseased meat and tuberculin positive cattle

B. C. G. Vaccine in the Control of Tuberculosis

The name B C G (Bacilla Calmette-Guerin) has been given a strain of virulent Bovine tubercle bacillus isolated by Calmette and Guerin in 1906 and which *permanently* lost its virulence after 13 years of culture in ox bile potato medium but fully retaining its antigenic properties. This degree of immunity developed by the intra dermic injection of a standardized dose used in many countries of the world has shown that the degree of immunity produced in uninfected animals and man is sufficient to substantially reduce tuberculosis morbidity and mortality. The maintenance of the strain and the technique of preparation and inoculation of the vaccine requires specialised knowledge and care. The immunity conferred by the B C G vaccine differs somewhat from the immunity by vaccination against small pox anthrax rabies enteric and diphtheria. It is akin to the immunity produced by an attack of syphilis in which the immunity exists as long as the human organism harbours even a small quantity of the specific germ or virus. The resistance is indicated by an intolerance more or less marked to re infection by the same specific microbe. It is thus applicable to the tuberculin negative population so that when the positive tuberculin reaction following B C G vaccine inoculation fails to be elicited (usually after 2 5 years) revaccination with B C G is needed particularly in the vulnerable groups of the population

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If mass vaccination is not possible the field for its use in a country like India which is on the threshold of industrialisation and where the tuberculosis morbidity and mortality are high in selected groups is enormous. The following are some of the selected groups to whom the vaccine is specially applicable —(1) new born infants especially in bustees crowded localities and tuberculous households (2) all tuberculin negative children adolescents and adults
or for work, (3) all
Police and labourers
negative individuals in
and hospital orderlies inmates of orphanages and lunatic asylums

Concluding remarks As public health is a purchasable commodity the whole scheme of control of tuberculosis visualised above may not be put into operation in industrially

co-ordination

II LEPROSY *

Leprosy is an infectious disease caused by the *Mycobacterium laprae*, which was first described by Hansen in 1874 Though at present principally a tropical disease, prevalent in the tropical and sub-tropical countries, in the middle ages it was epedemic in all the European countries, from where it later spread to the Americans and the West Indies The widespread campaign of isolating lepers in specially built leper hospitals during the 13th century and subsequently, led to a gradual decline of the disease in Europe and by the early 18th century leprosy had ceased to be a major public health problem

Clinical and Other Aspects

At present leprosy is mostly a disease of tropical and subtropical countries although there are some foci in the temperate and even in cool countries It is not possible to state exactly the total number of persons suffering from leprosy in the whole world, this number is very roughly estimated at 40 to 50 lacs Of this total about 10 lacs are attributed to India Some other areas with heavy incidence of leprosy are parts of China Africa, South America, Japan and some of the Pacific Islands In India the areas of highest incidence are found mostly in the Eastern parts of the country, although there are some foci of high incidence in the central parts also, these areas include Assam, West Bengal Bihar, Orissa, Madhya Pradesh, Madras and Hyderabad (Deccan) A moderate incidence of leprosy is found in the Himalayan foot hills Bombay, and northern & eastern parts of Uttar Pradesh, and the central parts of India There is practically no leprosy in Rajasthan and in the plains of Punjab and the western parts of Uttar Pradesh

Leprosy shows itself in two main clinical forms, a mild or benign type with lesions confined to certain areas in the skin and/or peripheral nerves, and a severe or 'malignant type, usually with widespread lesions in the skin mucous membranes and to a less extent in the internal organs According to the classification adopted at the International Leprosy Congress Cairo in 1938 the terms 'Neural' and Lepromatous are applied to indicate these two different and widely varying types However, the term Neural is not considered satisfactory and the Pan American Classification of leprosy uses the term 'Tuberculoid instead

The 'Neural' type of the disease is characterised by the presence in the skin of patches with sensory changes or disturbances of polyneuritic nature or both The patches vary greatly in size and number, may be situated on any part of the body, may be flat (simple) or thick and raised (tuberculoid), but the characteristic point about them is the diminution in or loss of cutaneous sensibility Another feature about these patches is the thickening of the cutaneous nerves supplying the area in which the patches are situated Bacteriological examination by the routine methods usually gives negative results Leprous

* In writing this section we gratefully acknowledge the help received from Dr Dharmendra the Head of the Department of Leprosy Research School of Tropical Medicine Hospitals, Calcutta.

polyneuritis i e the involvement of the nerve trunks produces symptoms similar to those produced by other forms of polyneuritis such as sensory, motor and trophic changes and deformities In leprosy however sensory changes are more marked than the motor changes The most commonly affected nerves are the ulnar lateral popliteal and the posterior tibial The other nerves often affected are the radial and the median Of the corneal nerves, the 5th and 7th nerves are commonly affected The involvement of the ulnar nerve produces anaesthesia of the little and ring finger and on the ulnar side of hand and forearm, paresis and wasting of the small muscles of the hand which may ultimately lead to the deformity of claw hand The involvement of the lateral popliteal nerve produces anaesthesia of the dorsum of the foot and the outer side of the leg and paresis of the peroneal muscles which may result in the development of drop foot The involvement of the posterior tibial nerve produces anaesthesia of the sole of the foot keratosis and trophic ulcers The involvement of the 5th corneal nerves may cause anaesthesia of cornea and conjunctiva and involvement of the 7th cranial nerve produces paresis and paralysis of the orbicularis oculi muscle causing ectropion and lagopthalmos The combined effect of the involvement of the 5th and 7th cranial nerves results in a gross interference with protective mechanism of the eye and the eye is very liable to get conjunctivitis keratitis and corneal ulcers etc

In the lepromatous type although the lesions are widespread throughout the body the chief lesions are found in the skin and mucous membranes The nerves are affected but there is much less nerve thickening and consequent interference with the function of the affected nerves than in the neural type, consequently sensory changes are not a marked feature of this type of leprosy The lesions found in the skin in this consist of diffuse infiltration flat hypopigmented or thick and red patches nodules and ulcers caused by breaking down of the nodules The lesions in the mucous membranes affect the nose eyes and throat etc The infiltration and ulceration in the nose often results in perforation of the septum the cartilaginous portion of the septum may be destroyed and the tip of the nose may fall in In the eyes the infection spreads to both the superficial and deep tissues producing conjunctivitis with nodulation of the conjunctiva superficial punctate and interstitial keratitis corneal ulceration iritis and irido cyclitis The involvement of the larynx produces hoarseness of voice and may result in difficulty in breathing Bacteriological examination of the skin and mucous membrane *lesions shows the presence of large number of leprosy bacilli*

The diagnosis in leprosy is based mainly on clinical grounds though in certain cases it can be confirmed by bacteriological examination A thorough clinical examination is therefore of prime importance for diagnosis The appearance of the lesion is often very characteristic and in several instances suggests the diagnosis Symptoms like impairment of the sweating loss of hair paresthesia etc may be suggestive but cannot be diagnostic of leprosy. There are only two clinical diagnostic signs viz the loss of sensation in the patches and limbs and thickening of cutaneous nerves and nerve trunks These two clinical signs together with the finding of lepra bacilli constitute the three cardinal signs of leprosy As a rule a diagnosis of leprosy should not be made unless at least one of these cardinal signs is present

In considering the differential diagnosis of leprosy there are two groups of diseases which have to be considered These are (1) disease producing lesions in the skin which may resemble the patches or nodules of leprosy and (2) disease *producing loss of cutaneous sensibility and deformities etc resembling sensory*

and trophic changes produced by the involvement of nerves in leprosy The most important in the first group are syphilides, tinea, leucoderma dermal leishmaniasis, psoraisis, lupus erythematosus and lupus vulgaris The most important diseases of the second group are traumatic injury to nerves polyneuritis due to conditions other than leprosy, and neuritis of individual nerves, the less common diseases in this group include cervical rib, syringomyelia Raynaud s disease etc

TREATMENT OF LEPROSY

In the treatment of leprosy the hydnocarpus oil and its preparations are our main stay Recently a significant advance has been made in the treatment of leprosy of the lepromatous type, as the new sulphone drugs have been found to be of value in the treatment of cases of this type Other remedies have been introduced from time to time for the treatment of leprosy, but have not stood the test of time In addition to the routine treatment for leprosy the various complications will have to be treated as they arise As in other chronic diseases a very important part of the treatment consists in improving and maintaining the general health of the patient This is done by means of nourishing diet, regulated life, and treatment of any complicating disease that may be present

1. Treatment with Hydnocarpus Preparations

Historical

...e long remedy for leprosy Its use possibly ... ntioned as a potent remedy against leprosy ... years ago In this ancient book the name ... a its use spread to other countries and it has been used in the treatment of leprosy in India China and Japan for centuries In the Western medicine its use was introduced towards the middle of the 19th century

Originally the seeds and the oil of chaulmoogra were used by mouth and the oil by external application In 1894 Tourtoulis Bey an Egyptian worker introduced the use of oil by subcutaneous injections The general adoption of this method of parenteral injection was greatly delayed because of the fact that the oil then available was irritant and painful ... to remedy th s defect by mixing the chaulmoogra oil with ... er it was found that ... expressed from old ... uitable The addition ... le for injection The ... ilar and is extensively used

In addition to the oil being used as such ethyl esters prepared from the oil have been used The ethyl esters have the advantage of being fluid at ordinary temperature The credit of first introducing the use of ethyl esters of the oil in the treatment of leprosy goes to another Egyptian worker Engel Bey Messrs Bayer & Co prepared the ethyl esters of the oil at the request of Engel Bey in 1907 and Engel Bey reported the successful use of the esters at the Leprosy Conference, Bergen in 1909 However little attention was paid to the use of ethyl esters of the oil till Hollman and Dean in 1919 reported good ... large group of cases The question of the preparation and use of esters was ... were made in the ... found irritant on ... is found to reduce ... India the addition ... of iodine and the

Other preparations derived from the total fatty acids of the chaulmoogra oil or from some fractions of these acids are the sodium salts of these acids The most well known of these preparations is sodium hydnocarpate prepared by Rogers and manufactured by Burroughs Welcome & Co under the name of Alepol It has been recommended for countries where supplies of hydnocarpus oil are not available

The chaulmoogra group of oils are obtained from the seeds of certain trees of the genus hydnocarpus and certain other allied trees The main sources of chaulmoogra oil are *taraktogenos kurzii* growing in Assam & Burma, *Hydrocarpus anthelmentica* growing in Siam and indo-china and *Hydnocarpus wightiana* growing in South West India along the Malabar coast Of the three common chaulmoogras *Hydnocarpus wightiana* is generally preferred now and the oil of *Hydnocarpus wightiana* is now official in the British Pharmacopia It is interesting to note that the 'tuvaraka' of Sushrata is indentical with *Hydnocarpus wightiana* *Source of*

Like other vegetable oils chaulmoogra oil is composed of fatty acids combined with glycerine Two of these acids have been isolated in the pure state and have been named ... ve principles ... een isolated. ... unsaturated ... e since they contai r a closed ring of 5 carbon atoms while all other known fatty acids have their carbon atoms in form of open chains Because of this structural peculiarity the acids of the chaulmoogric series have the power of optical rotation

(1) Pharmacology of hydnocarpus oil & its esters

The oil itself has no bactericidal action, perhaps because it does not penetrate the cell wall

Chaulmoogra oil is irritant to the skin and mucous membranes Nausea and vomiting are induced even with small doses such as 3 to 4 drops Though it is possible to develop slowly a gastric tolerance to larger doses (15 drops) there is no denying the fact that it is liable to set up anorexia and vomiting very frequently Not only the oil but the sodium salts of the fatty acids as well as the esters have pronounced irritant properties though much less marked than the original oil The hypodermic injection of plain oil in daily doses of 5 ccm was found by some workers to produce intense local inflammation and induration. According to Muir, if properly prepared oil from fresh seeds is used such accidents never occur

Th a to L

It has been said that chaulmoogra oil does not possess any systemic effect at all The researches of Rogers Read and others however, tend to show that it does possess some systemic effects Narcosis has been observed in animals to which hydnocarpus oil was administered by the mouth.

A preliminary stimulation of the central nervous system has been observed followed by paralysis with the ethyl esters of chaulmoogra oil, death may result from paralysis of the respiratory centre Strong central paralytic effect and a lowering of the systemic blood pressure following the administration of the ethyl esters and the sodium salts of chaulmoogra have been obtained

Apart from certain gastro intestinal effects the oil from seeds when properly extracted and stored produces very little other systemic action Irritant and toxic products are formed in the seeds when improperly collected.

Costel after administering to man the oil hypodermically in daily doses of 5 ccm reported fatty embolism of the lung in 2 cases Hypertrophy of the lungs pneumonia and broncho pneumonia have also been frequently observed by other workers According to Muir this should never occur in man if the injections are properly given.

Haemolysis is undoubtedly produced by intravenous injections of the sodium salts of chaulmoogric and hydnocarpic acids With proper dilution of the salts used, this haemolysis can be reduced to a *minimum so as not to entail any special risk to the patient.*

According to Read, chaulmoogra oil given orally in small doses produced a marked increase in the urinary calcium and also an increase of faecal calcium. Continued *administration, however, reverses the effect and favours calcium retention.*

A definite increase in the amount of nitrogen excreted in the urine after the oral administration of chaulmoogra oil has been observed by Read. This indicates a considerable degree of tissue breakdown. Continued administration of small doses of ethyl hydnocarpate shows progressive decrease in urinary nitrogen and a large increase in the ammonia excretion. This is an evidence of a marked degree of acidosis in the tissues

The ... seeds by hot or cold extraction. The see ... ie method used By hydraulic pressure ... r ether extraction the yield is much m ... ale yellow or a reddish brown colour ... own and devoid of therapeutic action.

Melting point	22 30°C	22 30°C.
Sp gravity	0952 at 25°C	0951 at 25°C.
Acid value	239	295
Saponification value	213.0	104.4
Iodine value	103.2	104.4

On hydrolysis the fatty oil yields the following fractions —

(2) Composition

1 Total fatty acids m.p 44 45° C.
2. Glycerol.
3. Non saponifiable portion.

The fatty acids are mixtures of several constituents and these can be separated by further analysis yielding

(*a*) Chaulmoogric acid
(*b*) Hydnocarpic acid.
(*c*) Probably some lower homologues of chaulmoogric acid *(not definitely isolated)*
(*d*) Palmitic, linolic acid, etc

Similar fatty acids are *contained in oils from* the seeds of Hydnocarpus anthelmintica, *H wightiana* and *H alpina* The Philippine trees *H venenata H alcalae* and *Pangium edulae,* the South American tree Carpotroche brasiliensis and the African tree *Onchoba echinata* also yield oil of a similar nature. The Chinese tree 'Ta Feng Tzu' is nothing but *Hydnocarpus anthelmintica* All the species mentioned above contain *chaulmoogric and* hydnocarpic ... different proportions The virtue of chaulmoogra oil has been shown to reside in ... the presence *of a ring of* ... oint at 68.5 C and is dextr ... *O₂—melts at* 60° C and is also dextrorotatory ...

(3) Selection of cases for treatment

The *injection treatment* with the oil and its preparations has been widely adopted The treatment is of value, but it has got great limitations In order to get satisfactory results it is very important to select cases suitable for ... patches showing no signs of activity ... in whom the disease has died ... the disease such as deformities, mutilations, ulcers, etc ... n this treatment, treatment of

two groups of cases show signs of activity, The signs of activity thickening of nerves, presence of leprosy bacilli in skin and mucous membranes, and a recent increase in the size or number of lesions

In addition to the oil being used as such certain preparations of the oil have been used for the injections such as the ethyl esters of the oil and the sodium salts of the total fatty acids of the oil or some fractions of these acids In India the two preparations commonly used are (1) hydnocarpus oil, creosoted or iodised In countries where the chaulmoogra trees do not grow and where the oil has to be imported from outside, the sodium salts of the fatty acids are sometimes used, the most well known being sodium hydnocarpate

ECCO (a mixture of ethyl esters, creosote, camphor and olive oil) and sodim morrhuate have sometimes been used in the treatment of leprosy Their use has however, been given up, although some persons still adhere to them without any justification whatsoever Sodium morrhuate has no place in the

getting 5 ccm of ECCO receives only 1 5 ccm of the ethyl esters, whereas another patient getting 5 ccm of the ethyl esters derives benefit of the full 5 ccm

As stated above, the two preparations commonly used in India are the oil and its esters Both the oil and the ethyl esters appear to be equally effective The oil is more viscid and therefore more difficult to inject, while the esters are [illegible] Moreover, are therefore above body [illegible] are given a special apparatus is often used to heat the oil and keep it at the required temperature If only a few injections are to be given at a time, there is no point in obtaining this special apparatus, the oil can be heated to the required temperature by putting it into a boiling water bath (100°C)

Since the treatment has to be a prolonged one, requiring repeated injections over a long period it is very essential that the preparations used for injections should not be irritant Only oil expressed from fresh seeds should be used oil prepared from stale and decomposed seeds is very irritant The suitability of the oil for injections can be tested by certain tests such as the acid and the peroxide values These tests are not always available to the general practitioners so that the best safeguard against using an irritant oil is to obtain the oil from a reliable source

After obtaining the supply, the oil should be stored under proper conditions to avoid oxidation, which will make it irritant When not in use the oil should be stored in a cool dark place away from sunlight and should be protected from dust It is preferable to obtain the oil in small containers so that when a bottle is opened it will not be necessary to use it over a long period

The dose for an adult begin at 1 ccm and should be gradually increased by 0 5 ccm to 10 ccm (many workers have used much larger doses but there appears to be no advantage in that) If there is excessive local reaction and pain the

dose should be reduced If lepra reaction occurs the injections should be stopped until it has subsided, and then only a small dose should be given

Interval between the injections is usually one week In the beginning however, when small doses are used these injections can be given twice a week, and towards the end of the treatment, when the patient has maintained progress, the interval between the injections can be increased to two weeks The interval between the injections can be increased to two weeks The interval between the injections may have also to be varied according to circumstances, for example, if a patient has to come walking over a long distance to get injections, it might be better to give injections at longer intervals, possibly giving a bigger dose

(4) Method of injections

The routes—The oil or the esters can be given by subcutaneous intramuscular and intradermal routes The best method appears to be intradermal since the method, in addition to producing a general effect, produces local effect in the lesions themselves However, it is not always possible to give the whole of the dose intradermally, and in practice the drugs are given by a combination of the intradermal and the intramuscular or subcutaneous routes Some workers have used intravenous route, but because of the likely dangers, this method is not advocated

It should be kept in mind that the injection is a form of minor surgical procedure and as in all other surgical procedures all the necessary aseptic precautions should be taken The drug to be injected and the apparatus for injection must be sterile, the skin through which punctures are to be made should be sterile as far as possible, and the protection of the puncture points may be necessary

The oil is sterilised in bottle in the autoclave under 20 lb pressure for 30 minutes at 120°C It should not be re-sterilised as that makes the oil irritant Due precaution should be taken to maintain sterility when the oil is poured out of these bottles

The syringe and the needles are best sterilised in an oil bath The ordinary method of sterilising in boiling water is not suitable because after boiling the syringe will need to be completely dried before the oil can be drawn into it For the oil bath pure olive oil or hydnocarpus oil that remains after the day's work may be utilised, it is heated in a small enamelled or aluminium bowl with the help of a spirit lamp or a gas burner, if available A thermometer is placed in the oil in the bowl to indicate the required temperature (130°C) Even without the thermometer one may have a rough indication regarding the suitable temperature of bath—the temperature is about 130°C, when the oil is about to boil If there is a gas burner the bath can be kept at the required temperature by regulating the gas jet, if a spirit lamp is used the required temperature can be maintained by regulating the distance of the spirit lamp from the bowl containing the oil

The needles are kept in the bath The syringe is sterilised by drawing in and pushing out the heated oil two or three times It is better to use an all glass syringe, for in the case of a record syringe there is a danger of its cracking at the metallic and glass joint, because of the high temperature of the oil used for sterilisation

The intradermal injections

The skin where injections are to be given is first cleaned of all dirt the lesion is then swabbed with methylated spirit The part is again swabbed with spirit after the injections if necessary the puncture points may be sealed with Tinct Benzoin Co

Site—The intradermal injections are given into the skin of the patches themselves If a patient has more than one patch the patches on less sensitive parts of the body such as back should be taken up first and when he gets used to the injections patches on more sensitive parts of the body such as face and hands can be injected

The apparatus—Intradermal injections can be given with an ordinary hypodermic needle with a fine bore but a special short intradermal needle is preferable This needle is provided with a guard which allows only about 2 or 3 mm of the needle to enter the skin unless undue force is used to push it in These special needles are supplied with an adapter so that the needle can be fitted to a syringe of any desired size While buying the needles it should be clearly stated that those are wanted for injecting oil otherwise needles with too narrow a bore may be supplied

When a large number of injections are to be given it may be advantageous to have the syringe mounted on a special metallic holder This type of holder is specially useful when a patch is being reinjected because in that case considerable pressure has to be exerted

Method—The skin is steadied with a swab of cotton wool in the left hand and the syringe is held in the right hand with the piston end in the hollow of the palm Punctures are made into the skin 2 or 3 mm deep inclining the syringe at an acute angle with the surface of the skin with the bevelled edge of the needle directed upwards Since the object is to introduce the drug into the corium of the skin the inclination of the needle will have to be varied according to the thickness of the skin in case of thin skin the syringe will be almost parallel to the surface of the skin in case of very thick skin and nodules it will be nearly vertical If the intradermal injections have been given properly there will appear small weals at the points of puncture where the skin is very thick instead of the weals the skin markings will become more prominent If the injections are given deeper into the subcutaneous layer no weals formation will be seen and there will be considerable bleeding

Dose—About 0 1 ccm is injected at each puncture point and the injections are spaced about half an inch apart An area of skin of about 1 square inch can thus be infiltrated with 1 ccm of the oil It is usual to give 2 or 3 ccm of the oil intradermally but about 5 ccm may be given by this method The rest of the dose if any should be given intramuscularly or subcutaneously

If a large patch has to be injected it should be done in part of the patch being done at one sitting and other parts at later sittings

Immediately after the injection the part should be swabbed with spirit cotton applying a little pressure to stop bleeding In case the injected part is very vascular or if the injections have been given deep into the subcutaneous tissue there will be considerable bleeding the pressure with the cotton wool will have to be prolonged For a day or two after the injection the part is protected during bathing

If injections are given too superficially, or if doses bigger than 1 ccm have been given at each *puncture point* there might be ulceration and later septic infection Application of calamine lotion is useful for the inflammation and the part may in addition be sprinkled with sulphonamide powder

Re-infiltration—The small swellings at the site of injection subside in two or three days The part should however, not be re injected a second time until a month has elapsed

(5) The intramuscular injections

Site—The most common site for the intramuscular injections is into the gluteal muscles in the buttock but if the dose is small some other muscle in the body can be utilised for the injection such as the muscles on the lateral aspect of the upper two-thirds of the thigh Injection into the gluteal muscles is best given in the upper and outer quadrant of the buttock to avoid any danger of striking against and injuring the sciatic nerve To ensure this the injection should be given a *few finger breadth below the highest point of the iliac crest* To be more sure one may demarcate an area for injection by drawing a line from the posterior superior iliac spine to the highest point of the greater trochanter of the femur If the injection is given in front of this line there is no danger of injuring the sciatic nerve which lies far behind the line The position of the posterior superior iliac spine is indicated by a small dimple about 2 inches from the median line above the medial part of the buttock The greater trochanter of the femur can be easily felt

Apparatus—A strong needle about 2" long is used The syringe and needle are sterilised by means of an oil bath as stated earlier

Method—The patient should sit on a stool or better lie on the opposite side The skin is sterilised and steadied by the forefinger and thumb of the left hand *the syringe being held in the right The needle is plunged through* the skin perpendicularly with a sharp stabbing movement directly into the muscle If the point strikes the bone the needle should be withdrawn slightly Before the injection is made the piston is withdrawn a *little to ensure that the point of the* needle has not pierced any blood vessel The oil should then be injected slowly and after the injection the part is gently massaged to help absorption If the injection is given rapidly or the part is vigorously massaged the patient may get a fit of coughing

While introducing the needle it is best *to guard about 1 cm of it with the* tip of the right index finger so that the whole of it does not go inside The precaution is helpful in case the needle *breaks off accidentally a part of the broken* needle will remain sticking out of the skin and it can be taken out readily

Dose—Up to about 10 ccm of the oil can be easily given at one sitting bigger doses may result in inflammation and abscess formation

If the patient gets a fit of coughing during the injection the injection should be suspended for a while and the patient *should be asked to sit with the knees* drawn up and the head lowered between knees

Occasionally a patient *may faint during the course of injection* if this happens the injection should be discontinued and the patient should be made to lie down and given a dose of stimulant mixture

If an abscess develops after the injection it should be opened up freely with an incision running forward and downward along the muscle fibres providing for a good drainage

If the needle breaks accidentally it should be taken out immediately, other wise it might later cause serious complications

Injections into muscles should not be repeated before the induration caused by the previous injection has disappeared Before repeating the injection there fore it should be seen that the part is not red hard or tender If the muscles on the two sides are utilized alternately there is not likely to be any trouble in this connection

(6) Subcutaneous injections

Site—In this method injections are given into loose areolar tissue lying under the skin Subcutaneous injections may be given under the patches or infiltrated areas along the thickened nerves and around clean perforating ulcers they can also be given under normal skin in front of the thigh and back of the arm

Apparatus—Strong needles about 2 long are used as in the intramuscular method

Method—The subcutaneous tissue is infiltrated in a linear fashion putting in about 2 ccm of the oil over a length of about two inches For giving injection under the skin the skin is pinched up between the left thumb and index finger and the needle is introduced into the raised fold parallel to the surface As the needle enters the loose areolar subcutaneous tissue the resistance to its onward passage is lessened and its point can be easily moved from side to side under the skin (Care should be taken that the point does not pierce any blood vessel) About 0 5 ccm of the oil is injected and the needle is withdrawn a little another 0 5 ccm is then injected and the needle is slightly withdrawn This is repeated three to four times

[illegible]

tissue below the skin

In case of perforating ulcers the injections are given into the tissues around the ulcer the needle being introduced through the healthy skin of the margin

Dose—Not more than 2 to 3 ccm of the oil should be injected at one place injecting it in a linear fashion as described above If the injection is given at more than one place the total dose at one sitting may be 5 ccm or more In case of a perforating ulcer about 0 5 ccm is injected at 4 or 5 points around the ulcer

After care—after the subcutaneous injection the part should be gently massaged The part should not be re-injected until the induration resulting from the previous injections has subsided

The improvement under treatment is usually slow and often very slow the treatment has therefore to be a prolonged one The actual duration of the

Dosage —The average dose is from 2 to 5 gm (5 to 12 5 c c of the 40% solution) The injections are given daily for 6 days in a week starting from 1 gm and working upto 5 gm provided there is no toxic symptoms Every two weeks treatment should be followed by one weeks rest

Sulphetrone —It is a cinnamaldehyde bisulphite derivatives of DDS DDS content 27 6%

When given by mouth absorption is very poor only 20% being absorbed from the gut the remainder excreted in faeces Parenteral administration however eliminates this wastage and therefore is more economical and possibly more effective For parenteral administration a 50% solution in distilled water is used after autoclaving or boiling This solution being highly acid is neutralised before autoclaving by addition of sodium carbonate in proportion of 1 4 gm to 1000 ml of the solution If the injection is painful a 20% solution should be used in its stead in greater quantity in order to administer the dose indicated.

Dosage—It varies according to the routes of administration being much higher when given by oral route than by parenteral route

Parenteral (*intramuscular or subcutaneous*) —1 c c of a 50% solution twice a week (1 gm a week) increasing by 1 c c per week until 4 to 5 c c twice a week (4 to 5 gm) have been reached and it should be continued further

Oral—Two tablets (1 gm) a day for one week then four tablets (2 gm) a day for one week and finally six tablets (3 gm) a day which should be continued.

Novotrone —Methods of administration and dosage are the same as that of sulphetrone

Diasone —It is a formaldehyde sulphonulate derivatives of DDS, DDS content 55 4%

Being poorly soluble it is administered orally instead of parenterally The absorption though not complete when given by this route is better than with sulphetrone

Dosage —One tablet (⅓ gm) once a day for 1 week then twice a day for 1 week and finally thrice a day (1 gm) which is to be continued further

Promizole —It is a thiazole derivative of DDS in which instead of a benzene ring a thiazole group has been inserted, DDS content 97 5%

Dosage —One tablet thrice a day (1 5 gm) gradually increased to 6 to 8 gm. daily

Diamino diphenyl sulphone (DDS)

Cochrane et al (1949) and Molesworth and Naraynaswami (1949) used the parenteral route giving injections of a 25% suspension in arachis and cocoanut oil Unlike its derivatives, however DDS is quickly and almost completely absorbed from the gut when given by the mouth and very slowly excreted in the urine Parenteral route of administration has therefore no special advantage over the oral route Usually two different courses of treatment with the drug have been recommended —

(*a*) *Daily treatment*—¼ to ½ tablet (25 to 50 mg) a day for 6 days in a week (Total 150 to 300 mg per week) gradually increased to 1 tablet (100 mg)

a day in the course of4weeks to be given 6 days each week (600 mg in a week) After a month the dose may be increased to 2 tablets (200 mg) a day but only in suitable cases and under strict supervision

(*b*) *Bi weekly treatment*—1 tablet (100 mg) twice a week for a fortnight, then 2 tablets (200 mg) twice a week for a fortnight and finally 3 tablets (300 mg) twice a week which should be continued

For general guidance it may be noted that the dosage of any given DDS derivatives should be proportionate to its DDS content Dosage in children should also be proportionate to their ages Children of 12 years and under, should receive half the adult dose and those under 7 years one quarter, Children however appear to tolerate sulphones well

(4) The type of cases suitable for sulphone treatment

Sulphone treatment has been recently used in cases of the more serious, i e the lepromatous type with generalised diffuse macular or nodular lesions in which are present a large number of leprosy bacilli This has resulted in an impression amongst many workers that the sulphone drugs are useful only in this type and are of value in the non lepromatous (neural or tuberculoid) type Dharmendra et al (1950) reported in the treatment of 15 cases of the tuberculoid type in which the clinical subsidence was much quicker under sulphone therapy than would have been expected under hydnocarpus treatment or an account of spontaneous arrest of the tuberculoid nature of the lesions in these cases There was no doubt 13 of the 15 cases were lepromin positive, lesions in most were histologically tuberculoid and bacteriologically they were either negative or only slightly positive, becoming negative early under treatment It can thus be concluded that sulphone drugs are of value in all cases of leprosy in which the disease is active and progressive irrespective of type of the disease

Results in cases of the Lepromatous type

Beneficial results are seen in all lepromatous cases, but they are more manifested in the advanced cases with extensive thickening nodulation ulceration and lesions of the eyes, nose and throat

(5) Clinical improvement

The first thing to be noticed is that further progress of the disease is checked Next the disease begins to retrogress slowly but surely And in the line the whole appearance of the patient and his outlook towards life are changed and there is considerable improvement in general health For any appreciable objective improvement one has usually to wait for about 6 months The first signs of improvement are observed in the healing of ulcers in the skin and nose and clearing up of the lesions in the nose and throat The marked all round improvement is usually seen after treatment for along 1 to 2 years

The clinical improvement seen in the various signs and symptoms may be summarised as follows —

Leprosy ulcers—Chronic leprous ulcers heal rapidly and do not recur The healing of the ulcers provide the first objective sign of improvement and contributes considerable to the wellfare of the patients

Nasal mucosa—The improvement in the nasal condition is evident before long The blocking of the nose gradually clears up and epistaxis if any stops nasal ulcers heal though a little more slowly than the ulcers on the extremities

Eye lesions—Leprous iritis and eye reaction respond well to treatment The pain and redness in the eyes become much less and gradually disappear and the eye reactions are less frequent and may be completely controlled With the improvement and settling down of the eye condition it is possible to undertake in suitable cases such operative measures as iridectomy and removal of an opaque lens measures which improve and restore eye sight but which cannot normally be considered in an eye subject to frequent flare ups

Reports from countries where severe eye lesions are more commonly seen indicate that such lesions as nodular iritis and diffuse irido cyclitis do not improve and may become worse under sulphone treatment

Larynx The lesions of the larynx gradually heal under treatment and hoarseness of voice due to involvement of the larynx improves greatly In patients with symptoms of acute laryngeal obstruction and in whom tracheotomy might seem imminent the sulphones quickly improve the situation and the patients are saved from tracheotomy

Nodulation and infiltration—Nodulation and thick infiltrated areas in the skin begin to shrink shortly after treatment The rate of subsidence is no doubt slow but the results are certain In some cases the nodules soften burst discharge and then cicatrize In others the nodules are absorbed without any matter being discharged In both instances after prolonged treatment one can find only scars in place of previous nodules

Lepra reaction—Leprosy is a chronic disease in which rapid changes are not usually seen but occasionally acute exacerbations occur and this acute flare up is termed lepra reaction Under sulphone treatment reactions become less frequent and less severe and finally are completely eliminated

Nerve pains—Improvement in this condition is very slow and it is only after prolonged treatment that response in this connection is seen

Bone pains—Under sulphone bone pains disappear in most cases This is possibly due to healing of leprous lesions in the bones

(6) Bacteriological improvement

The bacteriological improvement is slow and not as apparent as the clinical improvement The first change to be seen is not the reduction in the number [illegible] whereby the bacilli become beaded less [illegible] there is seen a reduction in the number [illegible] for the bacilli to disappear completely and on an average it takes 2 to 5 years for a lepromatous case to become negative

It can therefore be said that bacteriological improvement though slow is quite definite An important observation in this connection is that the nasal smears become negative earlier than skin smears taken from different parts of the body This observation together with the fact that leprous ulcers both in the skin and the nose heal rapidly under sulphone treatment have a bearing on the role that the sulphone durgs can play in the control of the spread of leprosy

Results in cases of the Tuberculoid type

It has already b
ment of active les
(thickness and redne
early In patients subject to repeated reactions this condition responds very favourably especially the thickness subsides much more slowly

(7) Toxic effects and complications

When an initial small dose is given which is increased gradually and unnecessarily high doses have been avoided as a rule there are no serious toxic effects Minor toxic symptoms however are most frequently met with diaminodiphenylsulphone and least frequently with sulphetrone used parenterally The most common toxic effects are anaemia asthenia giddiness and sometimes a burning sensation in the extremeties In case of oral administration gastric disturbances in the form of nausea vomiting etc are commonly seen Most of these symptoms however pass off gradually even if the drug is continued as tolerance of the drug is gradually acquired Other complications which require reduction or temporary withdrawal of the drugs are jaundice and a decrease in the R. B C count and haemoglobin confusional mental status neuritis iritis synovitis and drug dermatitis the last one responding well to any of the antihistaminic drug In case of iritis the drug should be kept dilated by the use of Atropine All sulphones are liable to set up a condition known as erythema nodosum leprosum (Walcott 1947) which is probably related to the Herxheimer reaction and represents an acute response to the rapid multiplication and breaking down of *M leprae* giving rise to high fever erythematous nodules and erythema nodosum like lesions The condition is on the whole favourable and calls for stoppage of the therapy only
then half the dose which pr
temperature has returned to
forms of reaction no special treatment may be needed beyond the symptomatic use of analgesics and hypnotics if required In the severe cases some special treatment may be needed for the control of reaction The most widely used treatment in some preparation of antimony Potassium antimony tartarate (P A T) has been widely used for the purpose It is given intravenously in 0 02 gm doses dissolved in 1 c c of saline every other day for 6 doses Foadin Fantorin and trivalent Antimony compounds are also useful

Another condition which is frequently seen is the appearance in some patients who are otherwise improving of small painful red nodules or raised patches which are transient and usually occur without any rise of temperature

(8) Limitations of the treatment

The sulphone drugs have no doubt marked a great advance in the treatment of leprosy but all the same they suffer from many limitations The greater limitations of sulphone therapy is the long time required for the complete elimination of the Leprosy bacilli from the skin and nerves varying with the nature of the lepromatous lesions it takes about 2 to 5 years for the bacilli to disappear from the skin and in not a few cases the bacilli may persist even after 5 years of treatment Moreover the bacilli may still be found in nerves after their disappearence In the skin another drawback of the sulphone treatment is the

tendency to relapse when the drug is stopped after the arrest of the disease This tendency is becoming apparent now and may be confronted more frequently in future years with the increase in the length of the experience The relapse rate amongst in patients in whom the sulphone therapy was discontinued was 45%

(9) Role of Sulphones in controlling the spread of Leprosy

If bacteriological improvement under the sulphone drugs were as rapid as the clinical improvement these would have contributed *greatly towards the control* of the spread of the disease All the same even with its limitations extensive use of the sulphone is sure to have an impression on the problem of the prevention of the spread of Leprosy *For extensive use of sulphone it is essential that* treatment with them be not confined to in patient leprosy institutions but made available in all the Leprosy clinics and general dispensaries so that infective *patients who are relatively being cured might be discharged from leprosy institutions* to continue their treatment for outside so as to make room for the other more infective patients

(10) General principles in treatment with the Sulphones

(a) *Blood examinations*—Because the sulphone drugs have a tendency to produce Anaemia it is necessary that the treatment with them should be regulated by periodic blood examination and wherever indicated sulphone treatment should be supplemented with iron yeast and liver

Before starting treatment with these drugs a blood examination should be made *and if the red cell count and haemoglobin are found below 60% the* patient should first be put on a course of haematenics and the treatment with sulphone drugs should be started after the blood picture has improved satisfactorily However, in the cases needing sulphone therapy very urgently small doses of the drug may be given inspite of a poor blood picture of the patient

(b) *A small initial dose*—Treatment with the sulphone drugs should be started with a small initial dose which should be only gradually increased The maximum dose *should not be beyond the usual recommended dose since larger* doses do not speed up clinical or bacteriological improvement

(c) *Rest periods*—*During the course of treatment the* patient *should get* periodic rest when no treatment with sulphones should be given This will minimise the chances of severe toxic symptoms and reactions and will give time *for the hæmopoietic system to recuperate*

In case of oral treatment the drug should be administered for 6 days in a week it being omitted on the 7th day, and after 3 months treatment 14 days rest should be given

In case of parenteral administration of the watery solution of sulphetrone the question of a weekly rest does not arise as the injections are given only twice a week However a fortnight's rest should be given after 6 months treatment

(d) *Choice of the preparation*—Of the sulphone drugs that have been commonly used promin cannot be the drug of choice since it is to be given daily by the intravenous route and since after injection it is quickly eliminated from the body Moreover it appears to be more toxic than other proprietary sulphones

For parenteral administration the best preparation is a 50% watery solution of sulphetrone or Novotrone The oral use of these drugs is very uneconomical, because large amount of the intake passes out unabsorbed

For oral administration diasone or diamidine is better than sulphetrone or novotrone For this purpose however the parent compound (DDS) is perhaps the best preparation, because of its very low cost and its efficacy in small doses by mouth DDS is the ideal preparation for mass treatment in countries like India with an enormous leprosy problem but with limited financial resources

(e) *Maintenance Dose*—In view of the tendency to relapses small doses of sulphone drugs should be continued for a long period Johansen and Erickson (1950) advocate that after an apparent arrest or inactivity of the disease maintenance doses of the sulphones should be given indefinitely as relapses are apt to occur if the drugs are discontinued entirely

3 Treatment with Other Drugs

Besides sulphones various other drugs used in the treatment of tuberculosis have been put to trial in leprosy with varying results These drugs include streptomycin aureomycin para amino salicylic acid (PAS) and more recently thiosemicarbazone

(1) Streptomycin

Johansen and Rickson (1950) reported that streptomycin and dihydrostreptomycin in doses of 1 gm daily intramuscularly have proved to be useful adjuncts to leprosy therapy They found these drugs effective for enhancing the regression of leprous lesions especially of the mucous membranes The drugs were found to be specially useful in patients in whom clinical improvement on sulphone therapy has been retarded with the addition of this antibiotic to the sulphone treatment there was seen renewed clearing of the skin and mucous membrane lesions These drugs are considered only adjuncts to sulphones since because of their tendency to produce vertigo and sensitivity reactions they cannot be continued as long as is possible with the sulphones

(2) Aureomycin

Johansen & Erickson (1950) have reported on a trial of aureomycin in 5 patients of leprosy treated for one year in daily doses of 1 to 1 5 gm orally Clinical and bacteriological improvement was noticed but all the patients had periods of gastric intolerance These workers are of the opinion that a statement on the ultimate effectiveness of aureomycin in leprosy must await further trial in a larger group of patients

(3) Para-Amino-Salicylic-Acid (Pas)

Dharmendra (1950) reported on the trials of PAS in 2 lepromatous cases of leprosy treated for 8 months The treatment was started with a daily dose of 20 gm which on account of intolerance had to be reduced to 15 gms given in divided doses every 3 hour as a 20% solution of sodium para amino-salicylate. Both the cases showed some clinical improvement It was concluded that PAS could only be used as an adjunct to sulphones but because of its high cost it has a very limited use

(4) Thiosemicarbazone

The latest anti tuberculor drug that have been tried in leprosy thiosemicarbazone (4-acetylaminobenzaldehyde thiosemicarbazone) This co pound was developed by Domagk in collaboration with workers of the Ba Laboratories and marketed under the name of 'Conteben" It is now be produced by other laboratories under the names of 'Tibione', 'Myrizon Thiacetazone' and 'Siocarbazone' etc Ryrie (1950) recorded promising resu in 10 cases of leprosy treated over a period of 4 months, all the patients reported to have shown clinical and bacteriological improvement Ryrie w of the opinion that improvement in cases had been more rapid than would ha been possible under the sulphone drugs and that the drug is less toxic than t sulphones Vegas *et al* (1950) have made a preliminary report on the treatme of 42 lepromatous cases for a period of 3 to 6 months According to the authors the initial results observed indicate marked therapeutic activity Johansen and Ericson (1950) have reported trials in 5 patients All the patien showed improvement, specially the far advanced lepromatous cases The dr is on trial also at the Leprosy Department of the School of Tropical Medicin Some clinical improvement has been seen but it is too early to arrive at a conclusions regarding the comparative value of the drug The genera impressio however so far has been that it is perhaps been effective than the sulphones an that it is not less toxic than these drugs as reported by our worker

(5) Other Remedies

A large number of remedies have from time to time been used in th treatment of leprosy At the time of introduction several of these remedie created great hope and enthusiasm, but none of them has stood the test of tim The following are some of these remedies —heavy metals vaccines and ser aniline dyes, diptheria formol toxoid etc

etals Injections of salts of heavy metals such as gold antimony coppe arsenic etc have been used by many workers in the treatment of leprosy Som workers have reported beneficial results both in the disease in general and in som special manifestations of the disease such as leprous condition of the eye an lepra reaction However none of these preparations is in common use fo the treatment of the disease in general some of the preparations are commonl used in the treatment of certain special manifestations of the disease Thus i lepra reaction salts of antimony are very commonly used and in leprous condi tion of the eye salts of gold are reported to produce good results

and Sera Some workers have used vaccines prepared from some acid fast organism including the tubercle bacillus and some supposed cultures of lepra bacilli and sera prepared by injecting horses and goats etc with these bacilli or with leprou tissues Few workers have reported beneficial results but on the whole the results have not been satisfactory

Dyes Aniline dyes such as methylene blue have from time to time been used in the treatment of leprosy At one time they roused great hopes, but these hopes have never been fulfilled

ia formol One of the recent new treatments of leprosy is the treatment by diphtheria toxin or toxoid The workers who introduced the treatment made great claims regarding the efficacy of this mode of treatment, but the experience of other workers has not confirmed the claims Most workers who have used diptheria

formol toxoid in the treatment of leprosy are of the opinion that in most cases this treatment is not beneficial and that in a few cases it is definitely harmful

4 Treatment of some common complications

(1) Treatment Lepra Reaction

During the course of both the neural and the lepromatous' type of leprosy one often sees a sudden exacerbation of the disease with an extension of the existing lesions and development of new lesions with or without constitutional symptoms such as fever rigor joint pains etc The term lepra reaction' is applied to th s sudden exacerbat on of the disease which is usually of a temporary nature *Symptoms*

In the milder forms of the reaction no special treatment may be needed treatment with hydnocarpus preparations is suspended and when the reaction has subsided a start is made with small doses

If the symptoms persist the patient is put to bed given light d et plenty of fluids aperients and an all ali mixture with sodium bicarbonate and sodium sal cylate It may be necessary to give analgesics to relieve pain and hypnotics to induce sleep

In severe cases of reaction some preparation of antimony is usually given for this purpose the following three preparations are in use (i) Potassium antimony tartrate (P A T) (ii) Fouadin and (iii) Stibatin Potassium antimony tartrate is given intravenously in 0 02 gm doses dissolved in 1 ccm of distilled water This dose is repeated every other day for six doses Fouadin a trivalent antimony compound may be used with advantage since it can be given intramuscularly The drug is available in 2 ccm ampoules One ampoule is given every other day for six doses Stibatin a pentavalent antimony compound (sodium antimony gluconate) is given intramuscularly and can be given daily in doses of 10 to 15 ccm

Complications like neuritis and iritis are no doubt seen apart from the lepra reaction but they are very commonly seen during this condition and need special treatment The pain due to neuritis may be relieved by local application of heat such as hot compress or diathermy injections of cobra venom or of vitamin B In cases with much th ckened and tender nerves the operation of decapsulation may be needed but the operation should be done by experienced workers *Complicat o*

The treatment of iritis or iridocyclitis consists of keeping the patient in a dark room or g ving l im an eye shade or dark glasses warm boric fomentation appl ed several times a day application of atropine sulphate (½ 1%) drops or ointment to keep the pupil dilated Treatment with sulphone drugs (promin d asone etc) produces very good results

(2) Trophic ulcer

Trophic ulcers are most commonly found in the sole of the foot These ulcers may be superficial without any necrosis of the underlying bone but more commonly they are deep with a necrosed bone at the bottom

In case of ulcers without any dead bone at the bottom the rest of the part and the usual antiseptic measures will often result in healing but the ulcers are liable to recur if the parts are not protected against injury and pressure In *Treatment*

treating superficial ulcer the edges are trimmed and the ulcers are cleansed by antiseptic dressings such as strips of gauge rinsed in lysol, eusol or mercuric perchloride solution changed frequently Dressing with sulphonamide powder is very useful (Excessive soaking should be avoided but if the ulcer is very *foul smelling it may be necessary to bathe the part in some antiseptic lotion* Great care should, however, be taken to see that the temperature of the bath is not very high and that the parts are carefully dried with spirit after the bath)

When the ulcer is clean and there is not much oozing the antiseptic dressings are discontinued and some soothing ointment is put on the ulcer to encourage and protect granulation tissue

In the treatment of these ulcers the rest of the part is important In a few cases rest in bed may be essential, in some others crutches or proper padded shoes to get off the weight from the affected parts may be needed Even after healing it is essential to avoid pressure on the affected part and properly padded shoes may be helpful

The ulcers with a dead bone at the bottom do not heal permanently unless the bone is removed or extrudes itself Dead bone is often present and can be detected by means of a probe passed down the sinus at the base of the ulcer If the presence of a dead bone is detected, it should be removed by a suitable operation, but not until sepsis has been controlled

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CHAPTER VI

MISCELLANEOUS BACTERIAL DISEASES

BRUCELLOSIS—UNDULANT FEVER HISTORICAL EPIDEMIOLOGY, GEOGRAPHICAL DISTRIBUTION, BACTERIOLOGY PATHOLOGY CLINICAL FEATURES DIAGNOSIS PROGNOSIS TREATMENT PROPHYLAXIS —TULARAEMIA GEOGRAPHICAL DISTRIBUTION, CLINICAL FEATURES DIAGNOSIS, PROGNOSIS, TREATMENT—MELIODOSIS BACTERIOLOGY EPIDEMIOLOGY, DIAGNOSIS CLINICAL FEATURES TREATMENT —BARTONELLOSIS GEOGRAPHICAL DISTRIBUTION AETIOLOGY PATHOLOGY CLINICAL FEATURES, DIAGNOSIS PROGNOSIS TREATMENT—CEREBROSPINAL FEVER BACTERIOLOGY AETIOLOGY, PATHOLOGY CLINICAL ASPECTS DIAGNOSIS PROGNOSIS TREATMENT PROPHYLAXIS—PLAGUE AETIOLOGY AND EPIDEMIOLOGY PATHOLOGY, CLINICAL ASPECTS DIAGNOSIS PROGNOSIS TREATMENT, PROPHYLAXIS

Brucellosis

Under this heading are included several closely allied febrile conditions produced by the members of the genus Brucella Two main varieties are recognised —

(1) Fever produced by *Brucella melitensis* formerly known as *Micrococcus melitensis* The infection is conveyed to man through the milk of infected goats The fever mostly occurs in tropical and subtropical climates

(2) Abortus fever is produced by *Brucella abortus* formerly known as *Bacillus abortus* The infection is carried from infected cows in which the organism has produced abortion probably through milk *Brucella suis* occurs in pigs and produces a similar infection in man This type occurs all over the world wherever disease occurs in cows

1 UNDULANT FEVER

Malta fever

Undulant fever (Brucellosis, Mediterranean fever, Malta fever, Gibralter fever) is a specific long continued febrile disease characterized by a series of pyrexial attacks with intervening periods of apyrexia The fever resembles typhoid fever and is characterized by constipation, muscular pain, anaemia involvement of joints, profuse sweats and enlargement of spleen Functional symptoms referable to the central nervous system are prominent The course of the disease is indefinite and often protracted, it may last 3 or 4 months or longer and the mortality is low Bacteriologically *Brucella melitensis*, *B abortus* or *B suis* are present in the blood in the spleen and other organs

(1) Historical

Bruce in 1887 first isolated the causative organism from the spleen of Malta fever cases Injections of pure cultures of the organism gave rise to a similar disease in the monkey In 1893 he suggested the name of *Micrococcus mel tensis* for the organism

In 1918 the close relationship existing between *Br abortus* and *Br melitensis* was demonstrated [illegible] culturally biochemically [illegible] Differentiation between [illegible] e strain of the organism

(2) Epidemiology

Brucellosis is a widespread *infection* throughout the world, natural infection bei encountered in goats cows, buffaloes, sheep dogs, horses and pigs. Man acquires t infection by direct or indirect contact *with the tissues* discharges or the milk intected animals. The milk of infected cows buffaloes and goats is commonly co taminated and the organisms are present in large numbers in the vaginal discharg of animals which have aborted. The organisms may also be present in the fæc and urine of infected animals. Unpasteurized cheese, in which the organisms have bee *shown to exist in a viable state* for prolonged periods is a common source of infectio in some countries Recently it has been shown experimentally that infection can easi take place through *minute abrasions in the skin* and observations have confirmed that quite a number of human infections, the portal of entry has been through minute cu or abrasions in the skin Butchers workers in slaughter houses, packers of meat ar people looking after animals are commonly infected by this route
According to Manson Bahr, the most susceptible age group is 6 to 30 years

In most countries the disease attains its maximum incidence in the spring and earl *summer months, the lowest incidence being found in the winter months*

(3) *Geographical distribution*

Though at first the disease was con ... Mediterranean area, with the advance in to be widely prevalent all over the wor there is *marked increase from July to* ... year to year In Tunis and Algeria undulant fever is produced by a strain which g different serological reactions to *Br melitensis* and which is known as *Brucella paramelitensis* The disease is present in most of the countries of Europe. In India the disease is me with in the Punjab and Baluchistan and occasional cases are reported from Bombay and Ceylon The disease is encountered in China, especially in the Yangtse *valley Cases* have also been reported from Asiatic Russia, the Philippine Islands Java, Sumatra, Borneo and also *from* Australia. Occasional cases *have been reported from most of the* latin American countries and in recent years a large number of cases have been met with in the U S A The disease appears to be widespread in Africa and cases have been reported from all over that continent.

(4) Bacteriology

Micrococcus or Br melitensis is a minute organism which may appear in coccal ovoid or bacillary forms. The organisms are 0 3 μ to 0 5 μ in diameter while the length may vary from 0.5 μ or less up to 2 μ. It is gram negative and generally occurs singly or in pairs or even in fours *Br abortus* and *Br suis* are morphologically indistinguishable from the above described organism
It is excreted in the urine of patients in 10 per cent of patients recovered from the disease. It abundantly occurs in the milk and urine of goats It has also been found in cows, sheep and horses.

(5) Pathology

Specific pathological changes are absent, the most striking feature being enlargement of the spleen. In acute cases the spleen is soft and diffluent, but in chronic cases the *enlargement is hard* and microscopically there is increase of both lymphoid and fibrous tissue Enlargement of the liver may also occur The blood presents a picture of microcytic anæmia, the white blood cells are diminished *in number* but there is usually a relative lymphocytosis The lungs usually show basal hypostatic congestion and sometimes areas of bronchitis or bronchial pneumonia may be seen

(6) Clinical features

The course and symptoms are irregular, but clinically three different clinical types of the disease *may be recognised*, the undulant type the intermittent type and the malignant. Hardy (1944) recognized an ambulatory type and mentioned irregular mixed and chronic varieties The cardinal symptoms are irregular fever, weakness enlargement of spleen, tendency to profuse sweating (in 80 per cent) and rheumatic manifestation in later stages of the disease Loss of weight is usual and emaciation may be marked in severe cases *The prolonged relapsing type* of undulant fever is usually associated with *Br melitensis* infections and is rarely seen in *Br abortus* and *suis* infection

After an incubation period varying from 5 to 17 days the disease starts insidiously In Malta the onset was acute in a large number of cases but careful investigation showed that the patient had not felt well for sometime and suffered from mental lethargy and tiredness In some cases acute respiratory infection including sinusitis preceeds the prolonged illness in others cystitis or pyelitis may occur The initial symptoms are headache generalised muscular pains lassitude weakness lack of energy loss of appetite and sometimes gastric disturbances There is anorexia a progressive loss of weight and fever accompanied by a sensation of chilliness appears in the afternoons or evenings The fever gradually increases and profuse sweating commonly occurs It is generally most irregular in character and may last for periods varying from a few days to several weeks or months It has a striking tendency to relapses For first few weeks of the disease there is nothing characteristic about the symptoms and it is not possible to make a definite diagnosis Later when the spleen becomes enlarged and the temperature curve becomes characteristic diagnosis is possible and can be confirmed by blood test

With the progress of the disease severe muscular pains especially in the lumbar and abdominal r various joints Inso marked prostration There is progressive during the second

Undulant type—This is usually produced by infection with *Br melitensis* and the distinguishing feature of this type is the occurence of relapses It usually has an insidious onset, with headache stomach disturbances rheumatic like pains in the back neck, arms and legs and insomnia restlessness and mental depression The temperature gradually rises to from 103 to 106°F with morning remissions and increase in the evening temperature after a period ranging from a few days to one to three weeks the temperature gradually begins to fall and there is a gradual improvement in the symptoms and fever Profuse sweating is a prominent feature during the remission of the fever The temperature may remain normal for an interval of a week or so after which the fever relapses again and all the signs and symptoms of the original attack are repeated though in a milder form

Types disea

Intermittent type—The onset is insiduous and a sense of progressing afternoon weariness is felt by the patient General aching pains headache feeling of chilliness in the evening distaste for food backache, pain in the joints and neck, constipation loss of weight are some of the common symptoms Weakness alone or weakness combined with anorexia is a persistent symptom The morning temperature is between normal and 101°F and the evening from 101 to 104°F The infection lasts from one to four months and the fever comes down by lysis.

Ambulatory type—This mild form of the disease is sometimes encountered there is low fever for a few days and symptoms are more or less absent *Br melitensis* may

Malignant type—This is a comparatively rare type of the disease the infection being with *B abortus or B suis* It is characterised by a sudden onset, sustained high fever with rigors great prostration severe constipation backache anorexia, acute toxaemia, cyanosis dry and brown tongue and commonly a fatal ending preceeded by extreme hyperpyrexia. Mortality rate is 40 per cent This type is rare in Malta.

Chronic atypical type—This form may show symptoms of enteric fever tuberculosis

elevated in the evening

Abortus type of undulant fever—This is also known as abortus fever, and is a variety of undulant fever produced in man by *Br abortus* and *Br suis* This fever has been re orted from Engl nd [illegible]

in melitensis infections, is not common and it is rare for the fever to continue for *more than three months* In pregnant women affected by the disease the incidence of abortion does not appear to be significantly higher than otherwise

is useful in diagnosis, blood culture *is successful in 16 per cent of cases*

Five types of abortus fever have been described —

(1) Classical undulant, (2) the arthritic, (3) the abdominal, (4) the genital (with orchitis), (5) *the catarrhal jaundice.*

Mild and chronic forms are often met with in *Br abortus* and *Br suis* infections In such cases the main complaint is one of chronic ill health with vague symptoms such as weakness loss of appetite, insomnia, irritability and *depression The patients may have a* low grade fever the temperature rising to no more than 99° or 100°F

Br melitensis may produce a swelling and effusion in a single joint. It may produce *superficial* abscesses over chest and abdomen without fever Osteomyelitis in long bones may be produced

(7) Diagnosis

As the diagnosis of undulant fever on clinical features alone is difficult and uncertain reliance has to be placed mainly on laboratory methods The principal procedures used are isolation *of the organism from the blood urine fæces or other pathological materials* skin tests, agglutination tests, compliment fixation test and animal inoculation

The skin test is based on the fact that in positive cases, the skin is sensitised to the *protein nucleate fraction of the organisms This fraction which is obtainable under the* trade name of Brucellergen", is derived from the ether extracted organisms and 0 1 ccm is injected intracutaneously into one arm, a saline control being used in the other arm In positive cases erythema induration and œdema more than 1 cm in diameter appears *within 24 to 48 hours If* 'Brucellergen" is not available a standard *Brucella vaccine* diluted 1 in 10 may be used but the results are not so satisfactory

Melitene reaction—This consists of intradermal injection of 0 2 ccm of killed broth cultures containing half a million organisms A red œdematous area is produced at the site which persists for several days if the test is positive In interpretation of these tests it must be borne in mind that a positive result only implies sensitisation of the skin and does not *necessarily* imply active disease.

The agglutination tests are of greater value in the acute cases than in the chronic ones In the latter the test may remain persistently negative in a considerable percentage of cases A titre of 1 50 is considered as giving evidence of past or present infection and a rising titre is of particular diagnostic value The antigen commonly employed for agglutination tests is derived from a smooth strain of *Br abortus* and serves equally well to demonstrate the presence of all the three strains Agglutinins generally do not appear till the second week and titre may rise to 1 in 6 000. It is better to use several strains of *Br melitensis* and paramelitensis Serum of tularaemia may agglutinate *Br melitensis*

The complement fixation test possesses no particular advantage over the agglutination tests and is only very much more complicated It is therefore not commonly employed. The technique is the same as for the Wasserman test, except that an abortus antigen is used.

For the animal inoculation test 1 to 3 ccm of citrated blood is injected subcutaneously or *intraperitoneally* into a guinea pig The animal is killed after six weeks and examined for enlarged joints and lymph glands Blood is taken from the heart for culture and agglutination tests

Differential diagnosis from typhoid and paratyphoid fevers influenza tuberculosis acute rheumatic fever, subacute bacterial endocarditis, *pyogenic septicaemia* appendicitis and cholecystitis and tularaemia

(8) Prognosis

This should be guarded if due to *Br suis* and it is fair in *Br abortus* infection Average mortality is between 4 and 5 per cent In Malta in a series of 500 cases the febrile stage was one month in 20 per cent two months in 25 per cent three months in 40 per cent and more than three months in 15 per cent of cases

(9) Treatment

The treatment is largely supportive and symptomatic The results of the use of chemotherapeutic measures in the treatment of undulant fever have not been encouraging Though the sulphonamide drugs and courses of autogenous or stock vaccines appear to do good in some cases they cannot in general be relied upon It should be remembered that undulant fever is of prolonged duration and the treatment necessitates a careful management of the case during the illness *Supportive.*

The diet should be light consisting of milk, custard light milk pudding, curdled milk (dahi) broths lightly boiled eggs etc Solids are not well borne when the temperature is high and tongue coated The diet should be liberal and at the same time overfeeding should be avoided Patients likes and dislikes should be consulted Plenty of bland fluids should be given by the mouth, barley water, flavoured with fresh lemon juice is very acceptable

Physical exertion and fatigue should be avoided during illness and after the temperature comes down the patient should rest for two to three weeks A change of climate is often beneficial

In septicaemic cases full use should be made of hydro therapeutic measures both external and internal The fluid and salts lost by profuse sweating should be replaced by intravenous injections of glucose in saline *Symptomati*

Constipation which is a prominent feature of the disease should be treated In the beginning it is best to administer some such purgative as calomel or jalap and thereafter the bowels should be kept open regularly with the use of such preparations as cascara sagrada or liquid paraffin Enemata may be given if desired

High fever should be controlled by hydro therapeutic measures If the temperature goes above 103°F, cold sponging or ice packs should be employed so as to reduce the temperature by a couple of degrees It is not wise to attempt to lower the temperature too much nor should the sweats be checked too suddenly Aspirin, pyramidon phenacetine, etc which are often used as antipyretic, are best avoided in this chronic and asthenic disease Small quantities may however, be used to allay headache For sleeplessness hypnotics such as veganin or allonal may be employed The patient should be kept in bed for as long as the fever lasts and for at least ten days after Every care should be taken to prevent boils and bed sores.

The painful joints and fasciae are best treated by hot water bottles fomentations and a belladonna liniment Morphine should only be used in severe painful neuritis which does not respond to ordinary anodynes Severe headache is usually adequately relieved by an ice cap

The stools urine and other contaminated material should be disinfected and all persons attending on the patient should take precautions to protect themselves as in typhoid fever

Various dyes and metallic compounds have been tried in the treatment of undulant fever but definite evidence as to their therapeutic value is lacking

Sulphonamides—Sulphanilamide and its derivatives have been employed by a large number of observers In acute brucellosis promising results were obtained in a limited number of cases with sulphanilamide but the concensus of opinion after tri

has no

also bee

terminate fever though in many cases relapes occured probably through inadequacy of treatment Toxic neurological symptoms occur with these drugs A blood level of 10 mgm per 100 ccm of blood is obtained before dihydrostreptomycin is given in doses of 2 0 gm per day (0 5 gm 6 hourly) for 14 days at least

Chloromycetin and aureomycin have also been tried with good results but remissions occur Aureomycin in 3 0 gm doses daily and dihydrostreptomycin in 2 0 gm doses together for 14 days have given good results Both these drugs have been combined with sulphadiazine simentaneously

Sulphadiazine combined with normal whole blood or fresh plasma has been tried intravenously

Vaccines—Favourable results have been reported after the employment of vaccines in the therapy of this disease in both Europe and the U S A for many years

Manson Bahr (1945) questions the value of ordinary stock vaccines and advocates the use of an autogenous vaccine prepared from organism isolated from the blood of the patient In such cases the initial dose should be 50 000 000 organisms and it should be progressively increased at three days [illegible] lerable local reaction but re Others recommend

(10) Prophylaxis

In such a chronic and debilitating disease as undulant fever prevention is the only method of controlling it the treatment being far from satisfactory As milk and certain milk products are the principle sources of infection adequate control should be exercised over the production and distribution of milk Infected animals can be detected by cultivating the organism from blood and milk As the *Brucellae* are killed by moist heat at a temperature of 60°C in 10 minutes proper pasteurisation or boiling of milk before consumption is absolutely essential It must also be remembered that cheese and butter also convey the infection and the milk used for these should also be previously pasteurised In addition as a precautionary measure in endemic areas the drinking water and food should receive special attention The urine and fæces of infected individuals should be disinfected

The importance of minute unnoticed abrasions in the skin and mucous membrane as portals of entry for the infecting organism are being increasingly recognised Proper protection should be insisted for nurses attending cases and for laboratory workers handling cultures of the organisms Rubber gloves should be worn Proper protections should also be given to all workers handling cattle or carcasses

The elimination of infectious abortion in cattle is a matter of difficulty All the animals should be tested by the agglutination test In a mildly infected herd, those showing positive reactions should be segregated As the uterine discharge of the infected animals is infectious all measures should be adopted for the isolation of the animal and the disinfection of the stall For the prophylaxis of animals vaccines from living organisms have been found to confer some degree of protection This procedure is not free from danger as some animals may thus become chronic carriers and continue to excrete virulent organisms in their milk for prolonged periods Heat killed organisms have also been employed for vaccination but the results have not been very encouraging

Vaccine

Prophylactic vaccination has also been tried in man but the results have not been very convincing Dubois and Sollier (1930) have recently used a killed vaccine prepared from various strains of melitensis and abortus organisms for prevention of infection in persons engaged in dealing with infected animals The vaccine contains 2 000 000 organisms per ccm They reported that in the vaccinated group of 111 persons all of whom were exposed to infection, there was not a single case whereas over 6 per cent of the control cases contracted the infection The first injection is of 0 25 ccm containing 500 million organisms, the second 0 75 ccm and the third of 1 ccm The protective value of the vaccine has been shown

2. TULARAEMIA

General

Tularaemia is also known as rabbit fever, Ohara s disease, plague like disease of rodents or glandular type of tick fever It is a specific infectious primarily fatal bacteraemic plague like disease of certain rodents, specially rabbits and hares The causative organism is *Bacterium* or *Pasturella tularensis* which is readily transmitted from rodents to man by the bite of a flea or a tick [illegible] In man it is characterised by chills fever [illegible] r at the site of inoculation regional lymph [illegible] w mortality

(1) Geographical distribution

Pasturella tularensis was first isolated by McCoy and Chapin in the U S A in 1911 from a plague-like disease of ground squirrels in California In the United States the disease is practically confined to California, Utah Indiana Kentucky and Ohio The disease is also met with in Canada Alaska, Germany Austria Czechoslovakia, Norway Sweden, Russia, Japan and Turkey

In man the disease is predominally encountered among the rural population especially field workers hunters and trappers and workers preparing rabbit skins for furs Man is usually infected by the bite of infected ticks especially *D andersoni* and *D variabilis* and of the deer fly *Chrysops discalis* Transmission may also be affected by contamination of the skin or conjunctivae with the secretions or body fluids of infected animals It is believed that infection may sometime occur through eating undercooked infected meat or through drinking infected water

In the acute disease in man an ulcer develops at the site of inoculation, and the regional lymphatic glands are enlarged. The enlargement may be considerable like the buboes in plague and suppuration and necrosis often supervenes

(2) Clinical features

Sympto

The incubation period usually varies from three to five days but has been reported to be as short as 24 hours in some outbreaks They disease starts suddenly with headache vertigo and chilliness and the temperature may rise rapidly to 103° or 104°F The fever is of characteristic daily remittent type After three to five days of initial

fever the temperature commonly falls to normal (especially in the mornings for one to three days) and the constitutional symptoms also abate The fever and other symptoms then return and usually last for *from 3 to 4 weeks* During the period of the acute fever the patient has frequent chills and profuse sweatings Cough is frequently an early symptom, it may be transitory or last for two weeks Profound *weakness* anorexia, loss of weight are constantly present. There may be *aching pains in the back and legs* prostration is severe and vomiting may be troublesome Bronchopneumonia may occur in about 18 per cent of cases

Relapses frequently occur appearing from eight months to two years after the onset, but they are usually of brief duration A second relapse is uncommon Rarely a condition of chronic tularaemia is encountered which is very disabling and is characterised by intermittent attacks of fever, great weakness and mental depression Usually recovery from an attack confers permanent immunity

Types Four distinct clinical varieties of tularaemia have been recognised according to the preponderance of certain s ... type is the commonest and over 80 per cent of the ca ... rimary ulcer on the hands or fingers accompanied by ... al lymph glands and also lymphangitis of the interv ... per cent of the cases the glands suppurate while in ... resolution

In the *oculoglandular* type of the disease the primary lesion is a conjunctivitis and the regional lymph glands of the head and neck and in severe cases also of the axilla, are involved Small discrete ulcers are commonly seen on the conjunctivae of both the upper and lower lids This type of the disease is generally severe and has a higher mortality It is said to comprise about 6 per cent of the cases of tularaemia

(3) Diagnosis

A history of contact with rodents tick or fly bite is significant along with severe abrupt onset appearance of primary lesion and buboe

...ion After the first week the agglutination test is of great value though in some cases agglutinins may not appear till the 3rd week. Usually the titre is 1 in 40 to 1 in 80 in second week, 1 in 640 in third week and up to 1 in 2560 in fourth week. A titre of more than 1 in 80 is considered diagnostic if Brucellas are not also agglutinated 1 in 20 is only suspicious Successive tests showing a rising titre to a high level in third week make diagnosis a certainty Once agglutinins appear they persist for years It must be remembered however, that there is cross agglutination between the sera and the causative organisms of undulant fever and tularaemia

The ... blood ly cultur... cases the inocu... ose of plague

Cutaneous reaction is produced by intradermal injection of very light suspensions of killed *organism*, a positive reaction read after 48 hours having the same appearance as a positive tuberculin test The test has the advantage of becoming positive in the first week or ten days

(4) Prognosis

The mortality is generally stated to be about 6 per cent Prognosis is less favourable if pneumonia develops Most deaths occur in the third week.

(5) Treatment

Treatment is mainly symptomatic Rest in bed good nursing and proper nourishment are essential Rigid isolation is not necessary Sulphonamide drugs have been tried with no beneficial effects No other drug is effective

Recently an immune serum has been prepared by Foshay from horses and goats and this is now available from the Mulford Biological Laboratories in both liquid and lyophile forms The average dose for an adult is 30 ccm and if marked improvement is not seen in 72 hours another 30 ccm is given The results with this serum treatment are variable To be effective the serum must be given intravenously in sufficient quantities, at the earliest momement and repeatedly Serum and vaccine therapy has been unsuccessful in the chronic form but early serum therapy prevents it *Serum*

Streptomycin 0 5 gm daily for six days by mouth or by equal intramuscular injections every 8 hours is often effective Herxheimer s reactions may occur if exadates are large Aureomycin in 9 6 gm doses by mouth is effective in some cases and chloromycetin has been tried with good results

Locally, warm saturated magnesium sulphate solution dressings should be applied to the buboes or half saturated solution of urea Incision of glands should not be performed except in the later stage when an abscess has formed Ocular lesions should be treated with continuous application of warmed magnesium sulphate and sodium chloride solutions and frequent lavage of the conjunctival sacs with warmed boric acid saline solution Germicidal eye lotion are useless

Prophylaxis—In endemic areas, rabbits and other rodents must be very carefully handled as the fur of even healthy animals may harbour infective tick fæces Sick or dead wild rabbits are especially dangerous to handle without proper precautions and rubber gloves should be worn by hunters cooks and laboratory workers handling rodents The carcasses of infected animals should be burnt The disease can be prevented or greatly modified by vaccination *Prevention*

3 MELIODOSIS

Meliodosis is a rare glanders like disease met within Burma and the Malay States and it is known as Stanton's disease, Bendocholera and Pneumo-enteritis glanders like disease of Rangoon It is an infectious disease caused by *Actinobacillus pseudomallei (B whitemori* The disease is naturally encountered in rodents and is closely related both clinically and pathologically to glanders Man is infected from rats probably by ingestion of contaminated food

(1) Bacteriology

Actinobacillus pseudomallei is an aerobic motile gram negative nonacidfast bacillus 1 to 2 µ long With Giemsa s stain a bipolar staining is obtained and in septicaemic cases may be mistaken for plague infection It grows very well on ordinary culture media like *Actinobacillus (Pferella mallei)* and may be readily transmitted to laboratory animals by inoculation into the skin by feeding or by spraying into the nose

(2) Epidemiology

Meliodosis is a natural infection of rats which is transmitted to human beings by the contamination of food and water with the urine or sputum of infected rats In spite of its close resemblance to glanders horses are not involved in the origin of the disease Transmission from man to man does not occur and isolation measures are, therefore not required

(3) Diagnosis

Fulminating cases may be mistaken for plague or cholera and those surviving the second week may resemble typhoid or miliary tuberculosis pustular cases resemble glanders and tertiary syphilis. Isolation of the organism is the only certain method of

Muller and Tyler (1930) showed that early verruga nodules when exposed to a *single properly graduated* dose or x rays are inhibited in their growth This justifies a trial of x rays in suitably graduated doses in treatment of verruga nodules in man Oroya fever should be treated on the same lines as for infectious fever Intravenous injections of salvarsan are said give beneficial results

Kikuth (1937-38) tried a preparation of arsenic and antimony SDT 386 B which was believed to have a specific action against *Bartonella infection in rats* and also in man This, however, has not been confirmed by other workers

Prophylaxis—Prophylactic measures rests on the destruction of sandflies and on avoidance of sandfly bites The sandflies bite at night, and endemic areas should, if possible, be avoided after sundown If this is not possible protection should be sought against the flies by means of insecticides and fine mesh nets Buildings in endemic areas should be made sandfly proof

5. CEREBROSPINAL FEVER

This is an acute specific fever, of world wide distribution, caused by *Neisseria intracellularis*, occurr
by a low morbidity
from man to man,
meningitis involving almost the whole of the cerebro spinal axis The disease *is most commonly met with in the young up to the fifteenth years and is uncommon* over thirty five years of age The highest incidence and mortality have been recorded among infants under one year of age Certain factors favours the *spread of the disease and these are climatic influences (particularly* winter and spring), fatigue, dirty habits and occupations, over crowding, bad ventilation and other factors which lower the body resistance All these predisposing factors are prevalent among the people inhabiting tropical climates

(1) Bacteriology

The Gram negative intracellular diplococci now known as *N intracellularis* were isolated by Weichselbaum in 1887 from the cerebrospinal fluid of patients suffering from cerebrospinal fever This organism is an extremely delicate one and requires special media and special care to keep it alive outside the body It produces an endotoxin but *no other animal is susceptible.*

(2) Aetiology

cess to the nasopharynx where it may occasionally set
preads to the meninges *There are two main*
ningococcus reaches the meninges the first is the
by a process of direct transmission from the
g into discussion of the evidence in favour of
modern and generally accepted *view as to the*
ich the upper nasal passages through air infection
the majority of cases lasts for a few hours or a
a few instances the meningococci may reach the
ission of the infection may occur *directly or via*
r route of infection it may be stated that in some
be recovered from the blood in early stages of
25 per cent of case
the disease

(3) Pathology

In acute septicaemic cases there may be no meningeal or cerebral lesion In ordinary cases there is suppurative *inflammation of the pia* arachnoid at the base of the brain and in cases of longer duration it is injected and purulent exudation is present in the sub arachnoid spaces On the cortex there is much lymph and there may be pus

over the frontal and anterior parts of the parietal lobes In severe cases there is pus over the whole of the brain and cerebellum the brain substance becomes soft and pink and there may also be haemorrhages in it. The ventricles are distended with fluid and often pus The spinal cord especially its posterior surface in the dorsal and lumbar

The cerebrospinal flu d is clear for the first 24 hours but it is under pressure and cocci may be present in large numbers The quantity is increased from the normal figure of 120 mm to 300 mm the fluid becomes turbid or purulent with increase of polymorphonu clear cells and proteins dextrose is absent

(4) Clinical aspects

Accord ng to Adams (1946) cerebro-spinal fever can be classified under four heads — (1) The class cal acute type in which delirium stiffness of neck and usually a rash are the predominant features (2) the acute fulminating sept caemic type in which the onset is sudden there is profuse skin eruption and extreme prostration followed by death before any treatment can be given (3) a less severe type in which inflamma ion of the joints and aching in the muscle of the extremit es are main characteristics (4) a chronic type in which febrile attacks with joint pains and mild eruption occur periodically Flu d from lumbar puncture is generally normal in all except the first

Various t

In classical acute type pharyngeal catarrh may or may not be present The temperature rises and headache vomiting fleeting joint pains and skin eruptions are present Fever is irregular at first and may even become normal for a day or two but it rises again from 102 to 104°F The muscles ... d and general irritability restlessne... es of the back are involved resu... s gn (sharp flexing of the head ... knees and hips) are useful signs of meningitis These symptoms take 1 to 5 days to develop and persist for one to three weeks Tremors of muscles twitch ngs clonic spasm and strab sn us are present the pupils are dilated on account of sympathetic irritation but in severe cases these may be contracted The deep reflexes are usually increased but may be lost Restlessness and delirium occur early and there may be coma. Skin eruptions may be hæmorrhagic or petechial and these may appear early on the first or second day ... ng rose spots occurring in ... ıess may persist even after ... ıally somewhat accelerated ... sent the respirations are ... Bowels are constipated and ... chiefly of polymorphonu

In the fulm nating form headache vomiting severe rigors coma slow feeble pulse are followed by collapse The spinal fluid is clear and meningeal symptoms may be slight or absent

days ... after ... of f ... pulse become very irregular and finally the patient dies. In septicaemic form meningococci may be present in the blood and symptoms may be those of the fulminating type or of the meningeal form Chronic septicaemia and malignant endocarditis may result

Chronic encysted meningococcal meningitis occurs in young infants and runs its usual course. The sequelae present in non fatal cases are deafness, blindness mental deficiency and general spasticity of the extremit es due to hydrocephalus

Complicat

Complications and Sequelae—Inflammation may extend along nerves (especially ... s frequently ... e auditory ... Arthritis ... re common but relapses are very

(5) Diagnosis

In epidemics diagnosis is not difficult but in sporadic cases it may be so Sudden onset with headache vomiting fever stiffness of neck progressing to retraction and other symptoms of meningeal irritation are helpful signs In the acute fulminating form haemorrhagic skin eruption is characteristic Lumbar puncture blood culture and blood count give a clue to the disease Agglutination titer usually does not rise above 1 in 100 and may be of some use Differential diagnosis has to be made from meningitis due to other causes such as pneumococcal or epidemic encephalitis

(6) Prognosis

In infants under two years the prognosis is unfavourable also in adults over 40 years of age Prognosis cannot be predicted till convalescence is established. Fatalities mostly occur at the end of the first week Mortality rate was more than 50 per cent but with the introduction of sulphonamide drugs and penicillin it is considerably reduced Convalescence is generally prolonged and may last several months

(7) Treatment

General management—The patient should be isolated in a well ventilated room until recovery and until the swab from the nasopharynx shows no meningococci The skin is sponged with tepid water twice a day The bowels are kept open by an initial purgative and then by enemata The bladder should always be watched to see if there is retention of urine and if so a catheter should be used Emaciation rapidly develops and therefore the question of nutrition is very important Bedsores readily form and therefore skin needs careful attention The position of the patient is frequently changed to avoid hypostatic congestion of the lungs

Diet—A diet consisting of milk peptonised or citrated if necessary (2 gr of sodium citrate in 1 oz of milk), cocoa etc, should be given in the early stages later bread and milk and as the patient approaches recovery a liberal diet consisting of fish, chicken etc may be allowed Administration of fluids in all forms—as plain water glucose or alkaline water (consisting of glucose 2 oz sodium bicarbonate 4 dr water one pint) should be freely encouraged from the very onset of the disease to combat toxæmia If the patient is unconscious nasal feeding with citrated milk small feeds but at frequent intervals (3 oz every two hours) should be given If vomiting is present lime whey albumin water or peptonised milk may be given and these are often retained by the patient

Local treatment—Along with general and systemic treatment local treatment of
these foc
ing with
solution
or 1 per cent chloramine solution directly applied to such regions are beneficial

Specific therapy—The main reliance in the treatment of cerebro spinal fever was formerly placed on anti meningococcus serum together with repeated withdrawal of the cerebro spinal fluid

Lumbar puncture—Before the introduction of antimeningococcus serum the practice of repeated lumbar punctures was considered to be the best method
ure of treatment This procedure if performed early and regularly relieves pressure in the subarachnoid space and thereby lessens the injurious effects on the nerve centres, particularly those in the medulla In the initial stage the fluid may be

under considerable pressure Characteristic changes in the cerebro-spinal fluid may be noticed on withdrawing it which are of great significance In some cases the fluid may be straw-coloured and coagulate into a solid mass due to escape of blood plasma into the cerebro spinal fluid yellow colouration of the fluid may be the result of admixture with pus The cellular content of the fluid gives an indication of the progress of the case towards recovery The cell count may vary between 700 to 30 000 per cmm with a predominant polymorphonuclear leucocytosis Globulin is always in excess The chloride content which is normally about 0 73 per cent is not altered Stained specimens of the centrifugalised deposit should be examined in every case The presence of meningococci can be demonstrated in a large percentage of cases It has been found that during the early part of an epidemic of cerebro spinal fever diplococci are found to be scanty and extra cellular forms may predominate Cerebro-spinal fluid may be withdrawn under local anaesthesia though general anaesthesia may be necessary in some cases Ker (1929) advised performing successive lumber punctures with the patient lying alternately on the right side and on the left side thus facilitating drainage from the ventricle which is uppermost This is especially important when the fluid from a patient does not show any pus

Cisternal puncture—Cisternal puncture is of considerable importance in diagnosis and treatment It is indicated in cases where adhesions in the spinal theca have prevented the withdrawal of fluid by lumber puncture

Irrigation of the spinal canal with normal saline at body temperature has been advocated in order to remove the pus and the meningococci and help in the circulation of the anti meningococcic serum inside the spinal theca About 30 to 40 ccm of the cerebro spinal fluid is withdrawn by lumbar punctu e and an equal quantity of normal saline at about 100°F is introduced into the spinal canal The fluid is redrawn and the process is repeated till the fluid which comes out is clear As much as 200 cmm of the normal saline is used in such a procedure

Antimeningococcal serum—Jochmann (1906) was the first to introduce antimeningococcus serum in the treatment of cerebro spinal fever and, prepared it by injecting horses first with dead and then with living cultures In the treatment of human cases he gave it in doses of 20 ccm subcutaneously or intrathecally It is however to Flexner (1907) that we owe our present knowledge of serum treatment of cerebro spinal meningitis He prepared the serum by subcutaneous injection into horses at weekly intervals of living organisms and autolysates alternately This serum was standardised by titrating it according to the complement fixation test and against the autolysate in guinea pigs From the time of Flexner until now many methods have been developed in the mode of preparation of an anti meningococcal serum so as to obtain the maximum therapeutic effect A more rapid procedure than that adopted by Flexner has yielded a polyvalent serum of high titre Numerous strains of different types are included in the preparation Griffith prepared a *Serum*
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wh

The serum is said to produce its beneficial effects by neutralizing the toxin and by directly acting on the organisms the multiplication of which is inhibited and the organisms rendered more susceptible to phagocytosis It should be

administered by the intrathecal intravenous and intramuscular routes Intrathecal and intravenous routes are *the usual methods adopted* in the acute stage Before introducing the serum intrathecally, it is most essential that repeated lumber punctures and efficient saline irrigation of the spinal cord be performed *to remove the pus* organisms etc which will prepare a field for the reception of the curative serum The general rule regarding the quantity of the cerebro spinal fluid to be withdrawn from the spinal canal is that the amount of serum introduced should be half the volume of the fluid withdrawn On an average about 40 to 60 ccm of the cerebro spinal fluid is withdrawn by a lumbar puncture and the spinal canal *is repeatedly irrigated with normal sterile salt solution* at 37°C till the fluid returns clear The serum warmed to body heat is then injected slowly the dosage being on an average 30 ccm. The foot end of the bed is kept raised for at least two hours after the administration of serum to facilitate gravitation of the serum towards the brain

As the disease is essentially septicaemic in nature in the acute stage about 10 ccm of the serum is also given intravenously along with the intrathecal administration for the first few days to combat toxaemia If the cerebro spinal fluid shows abnormal naked eye features and the pressure is considerably increased a much larger quantity of serum may be given intravenously The *whole procedure is generally repeated within eight hours in acute fulminating* cases then given twice daily till the fourth or the fifth day and once daily for the next five days The intravenous administration of the serum is repeated only during the septicaemic stage and is discontinued when symptoms abate

anti meningococcal serum [illegible] d early the severe form [illegible] d The anti serum is now mostly used in the treatment of fulminating cases along with sulphonamides

Chemotherapy Sulphadiazine is the drug of choice and an initial dose of 5 6 gm of a 5 per cent solution of sulphadiazine sodium should be given intravenously If given in 500 to 1 000 ccm of $\frac{1}{6}$ molar solution of sodium lactate the urine will be kept alkaline and precipatation in kidneys will be kept prevented or *it may be added to* 1 000 ccm of normal saline immediately followed by 100 ccm of water containing 7 5 gm of sodium bicarbonate This should be repeated every 12 hours if the patient cannot swallow but if he can do so 1 0 gm of sulphadiazine *is given with 2 0 gm of sodium bicarbonate every four hours* by mouth Urine should be tested to ensure that it is alkaline Care should be taken that alkalosis does not develop with large doses of alkali given Concentration of sulphadiazine *should be 10 gm per 100 ccm of blood*

Penicillin is equally effective and 3 00 000 units should be given immediately followed by 1 00 000 units every *8 hours till all symptoms of infection* have disappeared *e g* signs of meningeal irritation fever headache petichiae etc and cerebro spinal fluid cell count is not greater than 5 to 10 cells per ccm If spinal fluid has many organisms make a spinal puncture *allow 20 ccm of fluid* to run out slowly and inject 10 ccm of saline containing 10 000 units of penicillin repeat after 12 hours if meningeal irritation still present

If the patient is sensitive to penicillin chloromycetin in doses of 60 mgm per kilo may be given in three doses or aureomycin in doses of 5 mgm per kilo every hour for three doses followed by a similar dosage every two hours *by* mouth If patient is camatose it may be given intravenously in a buffered *diluant*

Symptomatic treatment—As in other acute diseases constipation often troubles the patient and to combat it calomel followed by a saline purge the following morning is a very useful procedure In very obstinate cases it is necessary to give an enema For the relief of headache an ice bag should be applied Vomiting often sets in during the acute stage and interferes with the nutrition of the patient To allay it a combination of morphine with hydrocyanic acid may be beneficial but repeated lumbar puncture is the most efficient measure to prevent vomiting Sometimes in intractable cases it is advisable to omit all feeds and keep the patient on glucose and saline injections for 24 to 48 hours Adequate rest is most essential in the acute stage of the disease and this can only be secured by promoting sleep In this respect morphine (gr ¼) has been found to be very useful especially in cases where it is accompanied by delirium and restlessness Morphine is also the only drug which relieves severe headache For cardiac failure digitalin (gr 1/100) hypodermically should be administered but not strychnine as this may precipitate convulsions

Emergency

Besides the treatment of emergency conditions in the disease adrenalin plays an important role in the treatment of cerebro spinal fever especially in the fulminating types The secretion of the active adrenal cells is said to be interfered with in this disease and the sudden withdrawal from the circulation of this important hormone may lead to loss of tone of the muscle fibres of the blood vessels and failure of the peripheral circulation Such condition is best avoided by treating all cases from the beginning with injections of adrenalin along with general treatment

Complications may set in during the active stage or the convalescing period of the disease If cardiac failure with great fall in blood pressure is apprehended saline infusion at body temperature should be at once resorted to with other cardiac tonics namely injections of digitalin (gr 1/100) camphor in ether (1 ccm) or cardiazol (1 ccm) etc Irritation due to an intense urticarial rash may be relieved by bathing in a warm alkaline solution or by the local application of one per cent menthol solution

(8) Prophylaxis

Prevention

Fluid intake and salt balance should be regulated and 5% glucose solution in distilled water or normal saline may be given The urinary output should be maintained at 1 500 to 2 000 ccm at least in 24 hours with alkaline reaction Blood transfusion and plasma may have to be given if shock is present In cases of collapse give desoxycorticosterone acetate in doses of 10 mgm intramuscularly once a day

The disease is endemic in most of the large cities few sporadic cases of post basic meningitis occur at intervals The normal carrier rate of meningococcus has been estimated to be as high as 2 to 4 per cent of the population of some of the large European towns The carrier rate of meningococci has not been determined for the cities in India but such investigation is urgently required and will prove of great interest and value In urban areas there are usually no carriers and the disease is not endemic For reasons that are not at present definitely established the disease breaks out periodically in epidemic form The evidence that has been recorded so far shows that a remarkable change occurs in the carrier rate of the general population in the event of an epidemic From the normal rate of about 2 per cent the number of carriers increases reaching a figure of about 20 per cent at the onset of epidemic and 80 to 90 per cent during the height of an epidemic The term carrier includes

persons with an infected nasopharynx either one who has not developed meningitis or one who having recovered from the disease itself harbours the organisms in his nasopharynx, the former is sometimes called the primary carrier and the latter referred to as the secondary carrier The great majority of carriers remain infective for about two months, some 15 per cent of them may continue to harbour the organism for about six months and a small proportion of 2 to 4 per cent may carry the organisms *for as long as a year* *Every* carrier is potentially infectious and a source of danger

In the prophylaxis of infection with meningococcus when the main source of contagion is by 'droplet infection sprayed from a carrier the essential step in preventing an outbreak or limiting its extension is to reduce overcrowding to ensure adequate ventilation and to encourage the people to lead an open air life In outbreaks limited to institutions such as schools etc a search for the carriers should be made and they should be isolated, but the detection and isolation of carriers in a large community is neither practicable nor possible

Various methods of local treatment consisting of local application of anti meningococcus serum, antiseptic gargles and nasal douches have been advised from time to time but when tested with bacteriological control all have proved valueless They however, have a great value both in the education of the public and the removal of gross lesions

Sulphadiazine in doses of 2 to 3 gm daily for a few days acts as a protective

6 PLAGUE

Plague is also known as Black Death or Oriental Plague It is an acute specific infectious disease of short duration with a high mortality and is characterised by inflammation of lymphatic glands septicæmia and petechial and diffuse hæmorrhage in the skin and the viscera It is one of the greatest scourges of the human race The disease is caused by *Past pestis* and is primarily epizootic among rats ground squirrels marmots etc At the present time plague is unevenly distributed throughout the world and is endemic in countries such as India The maintenance of infection in these areas depends on the infection of the rodents Periodically epidemics of plague break out among these animals and man is infected as a rule through the agency of the fleas In this way small isolated groups of cases occur every year If the endemic foci remain secluded plague is confined to that area but when communication is set up with the surrounding country, the disease assumes an epidemic character The rats and rat fleas may be carried from one place to another by means of railways ships or other modes of communication and in this way a secondary focus of plague develops from the primary site of the disease which may serve in its turn as the centre from which infection may spread to the surrounding localities Plague is always confined to dirty and insanitary quarters and attacks mostly the lowest class of people living under unhygienic conditions Extreme heat and dryness of the atmosphere are unfavourable for its spread In India it occurs when the mean temperature is between 50°F and 85°F with a high relative humidity

Some of the important endemic centres of plague are —Murine plague occurring in domestic rodents in China India Burma EastIndies Dutch East Africa West Africa and South America Sylvatic plague in wild rodents occur in China, Manchuria South Africa, Argentina and Western States of the U S A.

(1) Aetiology and Epidemiology

Types.

Transmission occurs from animal to man usually by the flea *Xenopsylla cheopis* and man to man transmission by direct contact, usually droplet infection in the pneumonic form The flea does not act as a passive carrier conveying the disease by its bites, but the organism multiplies in the flea and are injected into the new host in the act of feeding The gut of the flea thus acts as a living culture tube. The anterior part of the gastro-intestinal tract sometimes becomes obstructed and when the flea in this condition attempts to feed on a host regurgitations occur and bacilli are injected into the puncture.

Transmission to man by other means is less common but in small number of cases of bubonic plague are by entry of bacilli through abraded skin, *eg*, through feet and legs from cowdung smeared floors in the houses of poor people.

Epidemics of plague in India are associated with high incidence of disease in rats resulting in high mortality When the rat population is decreased the fleas migrate to man Pneumonic type is spread from man to man and low temperature with high humidity favours it

The causative organisms *Pasteurella pestis* is a short non motile non sporing and gram negative bipolar staining bacillus which grows well on ordinary culture media. The bacillus exhibits pleomorphism and is often encapsulated It appears as a coccobacillary organism or as large oval or pear shaped or club shaped involution forms (when grown in 2.5 to 3.5 per cent salt agar medium) The organisms grows well at 30° to 37°C Milk is not coagulated and there is no indol production. Characteristic stalactite growths and on alkaline agar small tranlucent dew drop colonies are produced in 18 to 24 hours pointing down occur in bouillon under oil Gunea pig is the best animal for recovery of the organism and a single virulent bacillus may produce death The bacilli are rubbed into the shaved scarified skin of the abdomen. The animal shows locally œdema conges tion and hæmorrhages, buboes are found in one or both groins and smears from the lesions or heart blood show plague bacilli

The organism is easily killed by drying in sun light and by ordinary chemical disinfectants It lives in the cowdung smeared floors of houses in India for 48 hours and in buried bodies of the dead from 3 to 30 days In frozen discharges or sputum the organism remains viable for prolonged periods

Plague tends to die out in low lying lands and spreads inland and finds an endemic home in the colder climate of the mountain regions In India the disease has died mostly in the Punjab where the mortality was specially high in the earlier period after the disease invaded India in 1896 but in the less affected United Provinces a steady mortality rate continued

Role of rat flea

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e [illegible]
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a [illegible]
a [illegible]
e [illegible]
(June to December) in Bombay plague persisted in *Rattus norvegicus* and flared up at the onset of the cold weather The natural mode of infection of these rodents appears to be from rat to rat by contact in the absence of the fleas In certain rats the disease has been shown to exist in a chronic form During the height of an epizootic of plague the lesions are those of acute plague but subsequent to this period numbers of healthy rats may show atypical lesions These rats are said to act as chronic carriers of the disease, serving to keep alive the infection from one epizootic to the next Though this view has not been accepted by the Indian Plague Commission, evidence has been recorded to show that in this way the disease remains endemic.

Other rodents are also known to harbour the infection and may be responsible for the introduction and spread of plague In Mongolia and certain districts of Southern Russia epidemics are associated with the occurrence of plague in a species of marmot [illegible]
in [illegible]
A [illegible]
fc [illegible]
m [illegible]

one such area formerly affected with plague remained quite free from the disease Similarly other rodents such as the gerbille or gerbil and the multimammate mouse have been found to be infected with plague by several observers in South Africa In certain parts of California ground squirrels have been found to be infected Several cases of human plague were traced to contact with these animals as the fleas infesting them readily attack men

Role of flea in plague—It has been demonstrated that plague is communicated to the rats by the agency of certain fleas as it is known that it is never communicable from animal to animal by simple contact. Chief among these are *Xenopsylla cheopis* and *Ceratophyllus fasciatus* Yersin in 1894 found that the dejecta of flies fed on infected organs of diseased animals showed plague bacilli Simond was successful in infecting a mouse with plague by injection of an extract of crushed fleas taken from a plague rat and several other workers later on conveyed plague from rat to rat by the agency of fleas The second Indian Plague Commission established the role of the rat flea in the transmission of plague and showed that if fleas are excluded, healthy rats will not contract the disease The fleas that have left the body of an infected dead rat convey the bacillus and in the absence of their specific hosts both of these types of fleas bite human beings

The bacillus it has been pointed out multiplies in the gastro intestinal tract of the fleas and is then passed out in the fæces, the period during which fleas may remain infective depends on several factors In Bombay during an epidemic the fleas remained infective for about 15 days but during non epidemic season for 7 days Under laboratory conditions the fleas may remain infective for 47 days A low temperature of about 50°F and a nearly saturated atmosphere are most favourable for the survival of the bacilli in the flea It has been found that as the cold weather arrives in Bombay the fleas increase in number and the epidemic among rats and man starts during this period. At the onset of hot weather the flea population decreases and plague in rats and man comes to an end During the off season sporadic plague cases occur in rats and also in man but the conditions are not favourable for its spread In other parts of India the incidence of plague depends upon climatic and other factors Where these conditions are unsuitable, plague either does not occur or runs a restricted course Madras on account of a high mean temperature prevalent throughout the year is relatively free from plague Another possible cause is that the predominant flea in the Madras Presidency is *X astia* which is a far less effective carrier of plague than *X cheopis* or *X fasciatus* The Indian Plague Commission showed that a rise of the rat epizootic and consequent outbreak of the human epidemic depends on three factors (1) a suitable mean temperature between 50°F and 80°F, (2) presence of rats and (3) rat fleas. This is the reason why 75 per cent of plague cases in India are distributed over the Punjab the Bombay presidency and the United Provinces In Egypt optimum temperature for an epidemic to occur has been found to vary between 68°F and 77°F a condition favourable for the development of fleas Besides the rat fleas the role of the human flea in the propagation of plague from man to man has been recognised and may be the cause of the outbreak of an epidemic in certain localities

(2) Pathology

The body is livid and subcutaneous haemorrhages are present There is lymphangitis
[illegible] ons The primary
[illegible] ish blood stained
[illegible] hagic mass The
[illegible] matted together
and there is [illegible] blood stained and
cheesy in con [illegible] r lymphatic glands
of the body [illegible] Secondary buboes
occur on the [illegible] ie characters The
spleen is enla[illegible] yellowish in colour
and may have a mottled appearance due to areas of necrosis There is extensive damage to the endothelium of blood vessels and lymphatics and this is responsible for cutaneous petichae and hæmorrhages in different parts of the body There may be congestion of the brain and meninges.

In pneumonic plague pneumonia is lobar in character There is intense congestion of the respiratory passages and haemorrhagic exudate in the alveoli in which large number of plague bacilli are present. The bronchial and hillus glands are involved

In rats the bubo is usually discrete hæmorrhagic and necrotic In India the buboes are mostly found in the neck while in the U S A these occur in the groins. In rats and squirrls the disease may become subacute or chronic and there is tendency towards formation of purulent foci in lymph glands and viscera.

(3) Clinical aspects

The incubation period is usually 2 to 4 days rarely 10 days, it is shorter in primary pneumonic plague, being not more than 2 or 3 days

Symptoms

In *bubonic type* the onset is sudden there being no prodromal symptoms, sometime there may be a day or two of
weakness and discomfort T
respirations are accelerated
anxiety or excitement, delir
red, face congested tongue c
is usual but diarrhœa may be present In latter stages signs of intoxication of heart occur, pulse becomes intermittent and dicrotic Urine is scanty and high coloured The
phatic gland. In
ent in the axilla
ed As the bubo
n on the 7th or
be accompanied
by intermittent fever In the acute stage there is leucocytosis up to 40 000 In patients who recover the temperature begins to decline from 5th to 10th day and may reach normal a few days after In unfavourable cases the temperature persists and the patient dies

Pestis Minor, a mild ambulatory type of plague has been described in which there is little or no fever or toxæmia There is often a bubo in the groin or in the axilla or neck. Sometimes these buboes suppurate but they may be re-absorbed. A form of tonsillar plague has been described in which severe tonsillitis is accompanied by secondary invasion of neck glands

Plague is essentially a septicæmic disease and towards the end of an attack of every form of plague bubonic or pneumonic, the bacilli are present in enormous numbers in the blood Crowell recognised only a primary bubonic and a primary pneumonic plague and classified the bubonic group into (1) uncomplicated cases (2) bubonic plague with early septicæmia or without superfic
(4) bubonic plague with second
cutaneous lesions The degree of
of the blood stream are depender
to the bacilli These morbid processes have no relation to the virulence of the infecting strain as freshly isolated human strains have been found to possess a uniformly high virulence

All persons are susceptible to infection. Considerable protection is afforded by an attack of the disease though a second attack sometimes occurs.

In *Septicaemic type* the symptoms are the same as the bubonic type only more severe, the patient dying in 3 or 4 days The blood contains large numbers of the organisms The case mortality in India is over 70 per cent

In *Pneumonic type* the onset resembles pneumonia the fever starting with chills prostration, pain in the chest cough and blood tinged or bloody sputum Physical signs are often nor marked but those of lobar pneumonia. In all these cases septicæmia is present and this type is invariably fatal on the 3rd or 4th day *P pestis* is present in the sputum in large numbers

Pneumonic septicæmic

Pneumonic plague may be either primary or secondary Most authors agree that primary pneumonic plague originates from a case of bubonic plague in whom a secondary plague pneumonia has developed Numerous investigations in this connection show that the lungs are secondarily involved in a considerably precentage of cases of bubonic plague The lung complications frequently occur when the primary bubo is situated in the axilla or neck. Other possible modes of origin of primary plague pneumonia have also been suggested. In
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customs which favour the transference of the infection

The spread of pneumonic plague is by *droplet infection* A vigorous cough may emit droplets to a distance of several yards The time of exposure of persons to droplet infection is an important factor in determining the chances of infection. The possible role of carriers in the spread of pneumonic plague whether pneumonia is of primary form or secondary to bubonic plague has been much discussed In a secondary plague pneumonia the bacilli may persist for some time after convalescence but there is no evidence that they are the source of spread of primary pneumonic plague The carrier in an epidemic of primary pneumonic plague is *a negligible factor in its spread* Similarly sick rooms and houses are not infective apart from the plague patient and it is unlikely that dust plays any part in spreading the infection. Overcrowding in badly ventilated houses is perhaps the most important factor Close contact and neglect of precautionary *measures against droplet infection greatly* increase the risk Many authors have stressed the influence of a cold climate in the origin of pneumonic plague, though it is certain that such outbreaks can also arise in hot dry weather In ambulatory patients or patients suffering from bubonic plague travel or other exertion may lower the power of resistance of the individual in such a way that it may light up a septicæmia or lung complication

Minor types of plague occur involving tonsils which may resemble diphtheria
Immunity—It is believed that one attack of plague may protect against another in laboratory animals however active immunity is not readily produced Both horses and buffaloes have been immunised against plague in India and anti serum has been produced.

(4) Diagnosis

In the presence of an epidemic there is no difficulty in diagnosis from clinical symptoms and appearance of a bubo is an *important evidence* *In primary septicæmic and primary* pneumonic type with no chest symptoms difficulty may arise Definite diagnosis depends on demonstration of *P pestis* in enlarged glands blood or sputum

Laboratory diagnosis—For bubonic plague the bubo is punctured with a hypodermic syringe and some juice extracted A thin film is prepared from it and stained by Gram's method, methylene blue or thionin blue Gram negative bacilli which have a tendency to stain more intensely at the poles suggest *Past pestis* For cultural examination inoculate (at 25°C and not at 37°C) both blood agar plates (pH 6 8 to 7.2) and broth tubes On blood agar the colonies of *Past pestis* are sticky and can be pushed along the surface in broth culture chain or stalactite formations may occur The definite test for plague is, however *by inoculation of the material into animals* two white rats and two guinea pigs should be inoculated both subcutaneously (one of each variety) and by rubbing some of the material on the dry shaved abdomen In positive cases the animals die in 3 to 5 days, and [illegible] ll be fo nd w th the bacilli in large numbers in the spl [illegible] ic type of plague specimens of sputum [illegible] for bubonic plague Animal inoculation [illegible] ther virulent organisms may be present in the sputum simultaneously the best results are obtained by inoculation of the nasal mucosa and conjunctiva *which allow plague bacilli to pass through* In septicaemia the organisms can be isolated from blood culture in all cases of plague blood culture gives positive results just before death

The only other bacillus which resembles plague is Pasteurella pseudo tuberculosis rodentium Both the plague bacillus and tularaemia organism pass through the shaven skin of guinea pigs and rabbits

(5) Prognosis

In pneumonic type recovery is very rare and in septicæmic type mortality is over 90 per cent. *In the bubonic type death rate may vary from 40 to 90 per cent*

(6) Treatment

In the treatment of plague every attempts should be made to relieve symptoms In the septicæmic form treatment should be directed on the same lines as *for* an acute infectious fever The asthenic tendencies of the disease should never be lost sight of and stimulants are indicated to resuscitate a sinking patient

During the early stage, headache and pain can be relieved by proper hydrotherapeutic measures An ice cap on the head and sponging of the body are very safe and efficient methods for lowering the temperature Antipyretic drugs should better be avoided Vomiting is often a troublesome symptom which can be relieved by calomel and a saline purgative, a mustard plaster over the epigastrium is also useful Morphine is by far the best drug to produce sleep or chloral and potassium bromide may be used In violent or very restless cases hyoscine is of service Cardiac weakness manifests itself early in the disease Hence cardiac stimulants may have to be frequently prescribed

For the local treatment of buboes, hot fomentations of carbolic acid are useful They should not be opened or excised, as excision may often be followed by serious results During convalescence tonics are indicated Patients should be isolated for at least four weeks after the temperature is normal

Specific treatment—Since the introduction of sulphonamide drugs the treatment of this disease has been put on a sound basis Intensive treatment should be immediately started with sulphadiazine or sulphathiazole the former being the drug of choice Wagle in Poona treated 180 cases of plague with a mortality rate of 12 per cent with sulphadiazine and 21 per cent with sulphathiazole In the septicæmic cases the fatality rate was 20 per cent and 22 per cent respectively as against 91 per cent with iodine treatment *Sulphonamide*

The concentration of the drug should be kept between 15 to 20 mgm per 100 ccm of blood during the first 4 or 5 days of the disease This can be done by giving 4 0 gm (60 grains) as initial dose followed by 1 5 to 2 0 gm every four hours day and night until the temperature becomes normal Afterward 0 5 gm (7½ grs) is given every four hours for 10 to 15 days It is advisable to give the initial dose intravenously and if the drug cannot be taken by the mouth give intramuscularly or by subcutaneous drip method

Sodium bicarbonate in doses of one drachm (4 0 gm) should be given with the initial dose followed by 30 grains (2 0 gm) every four hours till the drug is stopped If urine becomes acid in reaction renal complications may follow Large quantities of fluid should be given and urine frequently tested with litmus for its reaction The urinary output should not be allowed to go below 1500 ccm in 24 hours if renal complications are to be avoided

By the intravenous route the initial dose of sulphadiazine is 1½ grain (0 1 gm) per kilo body weight and subsequently 1 to 1½ grain (0 06 to 0 1 gm) per kilo may be given every six hours

The concentration of the drug in the blood should be frequently determined

Plague antiserum—There is much difference of opinion regarding its effectiveness It is undoubtedly effective in laboratory animals but such favourable results have not been obtained in man Bateriophage treatment has been tried but has not proved effective

(7) Prophylaxis

The prophylactic measures in plague depend upon the type of infection In pneumonic plague it is the human patient and not the rat which is to be considered The infections spread by the droplets of sputum laden with the plague bacillus and persons entering the room of the patient, the nurses and the *Preventive*

attendants are liable to contract the disease Persons who have been in contact with pneumonic plague patients should be separated and systematic medical examination made The quarantine period should extend for seven days after the last contact with the plague patients Physicians and attendants attending cases of plague should be protected by bag like masks or by several layers of gauze and cotton wool applied over the face and neck In China special costumes are worn which prevent infection

In the case of an outbreak of bubonic plague it is almost solely the rat and the rat flea which are responsible for the propagation of the disease The rat contracts the disease enters a house, and dies, then the harboured fleas leave the dead rat and feed on man The infected flea either introduces the bacilli into the wound caused by the bite or bacilli may be rubbed into a small superficial wound on the skin by the clothing, etc In some cases bed bugs and other insects have also been suspected as transmitting agents

raction *Rat destruction*—Rat destruction has been considered one of the most important items in the prophylactic measures Experience has however shown that it is an expensive and tiresome procedure on account of rapid breeding of this rodent In Kenya Colony it has been considered a failure, while in India Dennys thinks that this procedure is a useless waste of money as an anti plague measure Various other workers, however, report that rat destruction, vigorously conducted quickly exterminates plague The first measure in rat extermination is the disposal of garbage, no article of food should be left accessible to the rat Various ratproof houses have been prepared in endemic areas

The method of destroying rats with chemicals are numerous. Phosphorus paste made up with glucose can be spread on pieces of bread, strychnine and arsenic if used are placed in boxes which are large enough to allow the rats to get in Barium carbonate is considered to be a safe rat poison Kunardt (1920) found that 3 gr doses of barium carbonate in flour was much more effective in killing rats than other poisonous drugs and was not poisonous to man Fumigation of houses and other infected places with sulphur dioxide carbon monoxide and hydrocyanic acid, has also been practised but the last two are very dangerous Many workers during plague epidemics have tried to exterminate rats by impregnating bread or their bait with bacterial cultures The best known of these organisms are the *Danysz virus* which is closely related to *Salmonella enteritidis* and brings about fatal infection in rats their use has now been abandoned

In India, Tewari and Lall (1925) recommended a method which they consider better than fumigation of houses for the extermination of rats and rat fleas They use a mixture of potasium chloride 2 dr potassium nitrate 1½ dr sulphur 2 dr, powdered and mixed with 5 dr of red pepper and a handful of crushed dried neem leaves This is placed in rat holes over a 9 inch wick of cloth soaked in a saturated solution of potassium chlorate and ignited the holes being closed

Cyanogas is a light powder which releases hydrocyanic acid on contact with moisture The powder is blown into the burrows by means of a pump specially designed for the purpose, or a power blower may be used, the distributing nozzle being introduced into the burrow or in close proximity to it Personnel using 'cyanogas' should be protected with respirators

Besides these careful inspection of houses should be made in a plague infected area Houses that have had one or more cases of plague or in which infected rats have been found should always be disinfected to kill rodents and insects Rat proof houses are efficient permanent protection against these rodents All possible precautions should be taken to prevent contamination of grains and cereals Various measures have also been directed against fleas Cresol emulsion carbon tetrachloride and naphthalene are flea poisons but they have little penetrative power will kill fleas in 1 per cent concent inces a *sulphurous acid gas genera* used as disinfectants the last name

Vaccines—The use of vaccine for prophylaxis during epidemics has given encouraging results Haffkine s vaccine was chiefly used The protective value of this vaccine has been proved According to the Indian Plague Commission inoculation diminishes the incidence of attacks but is not an absolute protection against the disease mortality among the inoculated is said to be markedly decreased *Plague vacc*

Sokhey based on in infective dos power of va origin killed a living nor result obtain protected w vaccine Th subcutaneous injections of 0 5 and 1 0 ccm are given at intervals of 7 to 10 days stimulating doses of only 1 0 ccm are necessary It is believed that by both alive and dead vaccines the protection afforded does not last more than six months

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PART V

REMEDIES USED AGAINST RICKETTSIAL AND VIRUS DISEASES

CHAPTER I

RICKETTSIAL DISEASES

GENERAL CONSIDERATION—DISEASES CAUSED BY RICKETTSIA TYPHUS GROUP TYPHUS FEVER, BRILL S DISEASES, MURINE TYPHUS, SPOTTED FEVER GROUP ROCKY MOUNTAIN SPOTTED FEVER OTHER SPOTTED FEVERS, TSUTSUGAMUSHI FEVER OR SCRUB TYPHUS GROUP SCRUB TYPHUS FEVER, TSUTSUGAMUSHI FEVER Q FEVER TRENCH FEVER.

I. GENERAL CONSIDERATION

Rickettsia occupy biologically a position intermediate between bacteria and the smaller filterable viruses The pathogenic rickettsias are minute pleomorph c obligate intracellular *parasites which are adopted to life in insect tissues* A large number of organisms occur in insect tissues some of which are intercellular and while others are extracellular The pathogenic Rickettsias in mammals are probably related to this group They resemble viruses in that they invade animal tissues and multiply in the intracellular fluids of the body Morphologically they resemble bacteria in that they are visible through ordinary microscope They appear as bacillary, diplobacillary and filamentous forms and with the electron *microscope are seen as extremely small round bodies*

Free livn g bacteria such as colon bacillus possess a complete system of anabolic and katabolic enzymes and are able to grow and multiply on simple organ c compounds such as ammonia and inogranic salts etc Other bacteria such as influenza bacillus lack certain enzymes and therefore require complex proteins and their products of decomposition When thy invade animal tissue they multiply in the intercellular fluid and practically never occur within cells except in phagocytes These organisms can be easily cultivated on any of the ordinary media.

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whic ec media
with artificially
prod *n cellular*
fluid

The next group consisting of Rickettsia and viruses can only multiply within the cytoplasm or nuclei of living cells The pathogenic Rickettsias appear as colony l ke *masses* within the infected cells in the same way as some of the larger viruses are seen within the cells as elementary bodies Rickettsiæ however differ from viruses in that they are seen within the cells as definite d screte clearly vis ble organisms It has been *shown however that Rickettsiæ* maintain within cells a certain amount of independent metabolic activity They grow best in cells in which metabolic activity is lowered and cells are not multiplying while viruses grow best in actively multiplying cells

Characters of Rickettsiæ—Ricketts a can only be cultivated in presence of living cells Some Rickettsiæ e g of Q fever epidemic murine and scrub typhus are best cult vated in yolk sac of developing hens egg while those of spotted *fever grow best in* yolk sacs and on agar tissue culture They stain poorly with ord nary anil ne dyes but are well *stained* with Giema s stain when they appear as reddish *purple bodies*

Ticks mites small domestic and wild rodents small mammals dogs etc act as reservoir hosts of Rickettsiæ There is serological evidence that man may act as a reservoir of epidemic typhus Rickettsiæ may live and maintain infection in the insect vectors for life time Rickettsiæ of spotted fever may live in the tissues of their tick vector from generation to generation They live in the living cells of serous cavities and those of intima and media of blood vessels the organism living in the cytoplasm, or in the nucleus or in both

Diagnost features—The problem of epidemiology pathology diagnosis prophylaxis to that of virus diseases as on account of media special techniques are required to th cases centers round the development of taining living or surviving cells

In both virus and rickettsial diseases sulphonamides have little effect

Rickettsial diseases are diagnosed by serological reaction of patients blood mostly of a specific and non specific nati to be isolated and recognized against O non motile varian strains in use are the OX 19, cultures being used for agglutination.

Rickettsial diseases—The group of diseases produced by Rickettsiæ are the typhus group of fevers which include the classical or epidemic typhus rocky mountain fever or spotted fever and the mite borne Japanese river fever To these have been added Q fever and trench fever Megaw (1942) classified

formation is now available with regard to their immunologic and other properties

Pathogenic Rickettsia have been shown to have a tendency to undergo biological modification of a permanent nature after their sojourn in different insect vectors and insect hosts in the same way as viruses It has been contended that inspite of many Rickettsial diseases described there are only three main types of Rickettsiae —

(1) *Rickettsia prowazeki* responsible for the typhus group which is transmitted by lice and fleas

(2) *Dermacentroxenus ricketts* responsible for the spotted fever group and transmitted by ticks

(3) *Rickettsia tsutsugamushi* (*R orientalis, R nipponica*) responsible for tsutsugamushi groups transmitted by mites Two immunologic varieties of typhus and two of spotted fever have been recognized Cross immunity exists in experimental animals between the members of each group but not between members of different groups

Trench fever is believed to be Rickettsial in origin although it has not been transferred experimentally and final proof is wanting It is caused by an extracellular Rickettsia like organisms inhabiting the intestinal tract of lice

The aetiological agents of Australian and American Q fever although differing from other Rickettsiæ in that they multiply extracellularly under certain conditions, are closely related to Rickettsiæ American Q fever Rickettsiæ occur in the tissues of ticks but there is no cross immunity between this disease and spotted fever or typhus and it is quite different from tsutsugamushi

The palms of hands and soles of feet are not affected The rash fades during convalescence to a brownish pigmentation which gradually disappears

Prostration and cardiac depression appear with the skin eruption, headashe is severe and a stuperous condition supervenes The mouth becomes foul pulse weak and irregular blood pressure low Nervous symptoms such as mental excitement stupor or delerium are common and coma may occur They increase with the rise of temperature and gradually disappear as the temperature falls In severe cases coma may persist ending in death.

The general condition of the patient throughout the fever deteriorates and in uncomplicated cases death occurs from collapse, usually between 12th and 14th day but sometime as early as the 6th day or as late as after the 3rd week. In some cases after the temperature comes down, signs of involvement of the central nervous system continue ending in death. Complications such as bronchitis and broncho-pneumonia may set in and in most of the cases there is varying degree of congestion lungs There is loss of appetite and patient refuses food and nutrition suffers In non fatal cases by the 14th day the fever comes

is self limiting

Recrudescence may sometime occur after prolonged periods It has been shown that Rickettsiæ sometime persist in the body for years and may become active later This probably occurs when a mild infection has been contracted in childhood as recrudescence does not follow after a severe attack.

Complications—The complications commonly encountered are bronchitis broncho pneumonia, erysipelas nephritis parotitis and otitis media Broncho pneumonia most frequently occurs and is often the cause of death especially in comatose cases and large portions of the lung become involved. Gangrene of toes fingers ears genitals etc results from thrombosis and is characteristic of some epidemics In uncomplicated cases the patient rapidly convalesces and completely recovers with a longstanding immunity

Diagnosis—Diagnosis is difficult in early stages though in an epidemic there may be no difficulty in diagnosing individual cases from the clinical signs and symptoms such as skin eruption, intense headache, prostration, etc. The leucocyte count does not help as it may be normal or go up to 20000 There is no change in the cerebrospinal fluid. Lice if detected on patient may be helpful Wiel Felix reaction is positive in 50 per cent of cases by the end of the 1st week and in all cases by the second week. This reaction is of great value in distinguishing typhus from spotted fever and tsutsugamushi disease. Agglutination at the end of first week in dilution of 1 in 100 or over with *B proteus* OX 19 is suggestive evidence in disease being typhus A rise in titre is more important than actual height of titre on any examination and at end of febrile period it may be as
...rsist for weeks and in some cases for years in
of fever Napier considers that it is not safe
125 as suggestive of typhus and a rising titre of
...e stage of the disease This test is an example
to the fact that these two organisms have a
common carbohydrate antigen A single positive test provides early presumptive evidence of the disease

The complement fixation test which has been recently devised is highly specific in nature and is in most cases positive by the 10th day and in all cases by the 16th day As this remains positive indefinitely it is useful in determining whether there has been an infection in the past. Agglutination of Rickettsia by serum which appears by the end of
first week of disease is also diagnostic, ... he same way
as Wiel Felix reaction Rickettsia may ... ute stage by
inoculating guinea pigs intraperitoneall ... ius produces
fever for 8 days but does not give tunica ... iurine typhus
and other rickettsial infections do Even ... t passage the
second passage is negative

Treatment—During the last few years the therapy of Rickettsial Diseases as undergone a remarkable change While formerly there was no specific reatment for this group two of the new antibiotics namely Aureomycin nd Chloromycetin (Chloran
n typhus the following dos
he basis of treatment in typh
f bed sores Constipation
e kept clean with frequen
ermanagnate solution

every 3 hours by the mouth until
The drug has usually to be given
e in the course of disease This
antibiotic can also be given intravenously in a special buffer solution containing eucine and sodium hydroxid 50 mgm of aureomycin is dissolved in each 2 5 ccm of the buffer solution Intramuscular injection are however painful

Chloromycetin (Chloramphenicol) The drug is sold in 0 25 capsules An

for intravenous or intramuscular administration Chloromycetin produces prolonged bitter taste in the mouth when high concentrations are present in the blood Aureomycin may produce nausea vomiting and diarrhoea If this occurs the dose may be reduced The above mentioned treatment is effective against typhus epidemic and neurine

If the patient cannot swallow the powder which is sparingly soluble may be given in water or milk by a stomach tube No untoward effects on kidneys or blood forming organs have been observed with these two antibiotics but urine and blood should be examined before and after their exhibition The basis of dosage given above is 150 pounds for adult and 1/2 to 1/3 dose for a child of 50 pounds

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foods and preparations of amino acids may be given by stomach tube

Ample fluids should be given by mouth to control toxaemia and if this is not possible they may be given parenterally In dehydrated and toxic cases intravenous infusion of saline or 5 per cent glucose solution have given good results Delerium should be controlled with ice bags on the head and frequent sponge baths In severe cases phenobarbitone may be tried first and then codeine If these are not effective hyoscine hydrobromide may have to be given with or without morphine Some time lumber puncture gives relief The heart should be carefully attended to and cardiac stimulants should be used when necessary Brandy given in frequent doses of 2 to 4 drachms is useful Digitalis and strychnine are not so effective as camphor in ether coramine or cardiazole.

Penicillin or sulphonamide drugs should be used where pneumonia is present Codeine gives relief from cough in these cases

Prognosis—In e dem [illegible] ehorne t ph s he mo [illegible] anges from 10 to 70 per cent it is much greate [illegible] about 10 per cent in persons below the age o [illegible] being over 50 per ce t after the age of 50 ye [illegible] rse i s the deb l tated and ill nourished. The mortality may be 100 per cent in time of famine Proper nurs ng and treatment plav a very important part in reducing mortal ty

Prophylaxis—Typhus is a very infectious disease and very great care has to be exercised by nurses and *doctors who come in contact with such cases.* A tragedy recently occurred in one of the Mission Hospitals in Kashmir where a doctor and nurses lost their lives when attending on a patient and a number of other of the staff contracted the disease Louse proof gowns have been devised and these should be worne Attendants should wear clothes saturated with D D T *As dried louse fæces are highly infectious the attendants should* wear masks goggles and rubber gloves when near a typhus patient Delousing of the population should be carried out on as large a scale as possible as a prophylactic measure in preventing spread of infection The writer successfully stopped an epidemic in Kashmir by this measure The threatened population should be *protected with vaccination All individuals in contact with a case should be* immunised by vaccination and the clothes of all contacts should be deloused *Personal cleanliness is of very great importance*

Typhus vaccine—Formerly vaccine was prepared from the intestines of l ce *infected by rectal injection but this method has now been discarded* The following methods are now used for preparation of vaccine from human strains of Rickettsia —

(1) Agar slant tissue culture method
(2) Rat lung method (Castaneda)
(3) Yolk sac method (Cox) which has now largely supplemented other methods This vaccine was used on a large scale for vaccination during the World II with excellent results The vaccine is given in doses of 1 ccm three injections of 1 ccm being given at the *interval of one week The immunity is not lasting* and a stimulating dose of 1 0 ccm of vaccine has to be given every 3 to 6 months *so long as there is danger of infection There appears to be little* doubt that mortality rate is considerably decreased in the vaccinated and protection is also afforded against infection

(2) Brill's Disease

This disease was considered to be allied to *murine typhus* but recent work especially on the serological side has shown that it is a mild non fatal type of epidemic typhus The disease occurs sporadically especially among Russians who probably have had attack of ordinary typhus

(3) Murine Typhus

(Also known as endemic typhus)

This is a mild febrile disease caused by *R mooseri (R muricola)* which is transmitted from rat *to man* by the rat flea either by flea bite or by *ingestion of* food contaminated with urine of rats The main reservoir of infection is the rat (possibly mice also) The disease is passed on from rat to rat by the rat louse which does not infest man The rickettsia does not kill the rat louse or

the flea and the infection to man is sporadic from close association with the rat The disease is endemic and sporadic and in endemic areas its incidence may be high

The rat flea prefers to feed on rats and only goes to man if the rat dies After ingestion of human blood the intestines of the flea are obstructed and it may bite man

Distribution—Murine typhus occurs in Southern Europe the south eastern State of the United States Mexico (where it is called tabardello), South America, Manchuria, Malaya and India.

Pathology—As fatalities do not occur with this disease pathology has not been studied but in the main pathological lesions resemble epidemic typhus The cutaneous reactions are very mild

Clinical aspects—Murine typhus is a much milder disease otherwise the symptoms are very similar to human typhus The onset may be abrupt or gradual after an incubation

Diagnosis—It cannot be differentiated from human typhus by Wiel Felix reaction or from spotted fever By guinea pig inoculation it can be differentiated by the fact that there is scrotal swelling without necrosis and numerous Rickettsiæ are found in the tunica vaginalis

Immunity—In experimental animals infection with either epidemic or murine typhus produces definite immunity against infection with the other This immunity may last a year There is however no cross immunity against other species of Rickettsia

Prophylaxis—Rat proofing is the best prophylactic measure, rat destruction by poisoning and trapping is also helpful Rat flea must be destroyed to prevent its carrying infection to other rats The danger of heavy louse infestation in areas of endemic typhoid should be borne in mind because of the possibility of its changing over to the epidemic form

Prophylactic inoculation with vaccine from either the epidemic typhus or murine typhus protects against an attack of either disease

Treatment is on the same lines as epidemic or human typhus

2. SPOTTED FEVER GROUP

Rocky Mountain spotted fever is a proto type of the group of fevers to which belong the Eastern spotted fever, Brazilian or Sao Paulo typhus, Fievere boutonneuse which occurs in countries along the Mediterranean shore (dog is the intermediate host) and Tick bite fever of South Africa All these fevers are transmitted by bite of ticks whose species differ in case of different intermediate mammalian hosts Rocky Mountain fever will be described in detail as a typical example of this group Others have similar signs and symptoms, there being only minor clinical and immunologic variations.

thereafter is effective Generally temperature comes down within 24 hours but in some cases it may take 48 to 72 hours *Best effects are produced if treatment* is started within eight days of commencement of disease but even when used later it is beneficial If necessary it may be given by stomach in saline or distilled water

Aureomycin is equally effective in this disease and is *given in an initial* dosage of 1 5 gm by the mouth and thereafter 0 5 gm every four hours till the patient is afebrile for 24 hours Aureomycin bihydrochloride can be given intra venously, 1/5 of the oral dose being effective by this route It may produce diarrhoea nausea and vomiting

If these antibiotics are not available the sodium salt of paraminobenzoic acid (PABA) may be used The initial dose is 8 0 gm and concurrently 6 0 gm of *the sodium salt is given intravenously in 500 ccm of saline* 3 0 gm of the drug is given every two hours for 24 hours till the patient is afebrile which usually takes 3 to 4 days It acts best when given in the first seven days of disease and PABA blood levels should be checked by Brotton and Marshall s method. Optimum level required is 40 mgm per 100 ccm, more than this may be harmful *as delerium may be produced Acidosis may some time occur if urine is markedly* acid sodium bicarbonate may be given If this drug is used in large doses for prolonged period fever may result and injury to liver may be produced Patients strength should be conserved and he should be given suitable diet Vitamin deficiency should be guarded against and riboflavin is specially indicated Careful nursing is important and patient should have tepid sponge baths frequent enemata, ice cap on the head

Prophylaxis—Infection by ticks should be avoided either by their bite or crushing them with fi [illegible] Those who have to work in [illegible] boots Everyday afte [illegible] for a tick all over the [illegible] *it must be carefully removed with a forceps or a piece of paper so that it is not* [illegible] fingers The bite should afterwards be washed with pure carbolic [illegible]

Immunisation of persons working in tick infested area by means of vaccina tion is an effective measure The vaccine is prepared from the tissues of ticks infected with strains of Rocky Mountain spotted fever and is given once a year *Vaccination not only reduces incidence of fever* but also decreases the severity of the disease if it occurs Vaccine prepared from one strain may be effective against some of the other strains of spotted fever It is also believed that vaccina tion carried out within 24 hours of removal of an engorged tick from the body is protective especially against the less virulent strains

The method of preparing vaccine with culture in egg yolk sac is *still in* experimental stage

(2) Other spotted fevers

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(iii) Other tick borne typhus like fevers—In certain parts of India tick fever occurs

Treatment and prophylactic measures are on the same lines as Rocky Mountain spotted fever

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Boyd (1935) studied 92 cases of sporadic typhus According to the agglutination responses elicited, 35 cases were of mite typhus and 27 of flea typhus The fact that infected ticks were not always found is of no consequence in view of the experience gained with Rocky Mountain fever Further evidence regarding the existence of these infections in India is accumulating Most of the work is based on serological findings

3. TSUTSUGAMUSHI FEVER OR SCRUB TYPHUS GROUP

(1) Scrub Typhus Fever

The scrub typhus is widely distributed in southern and eastern portions of Asia. Tsutsugamushi was originally described in Japan but identical diseases known as rural or scrub typhus occurs in Malaya, Mossman fever of Queensland, pseudotyphus of Sumatra (Vector *T deliensis*), Mite borne typhus of India, Ceylon, New Guinea and others are of the same origin. Scrub typhus also occurs in Formosa, the East Indies, the Philippines and many other places.

(2) Tsutsugamushi Fever

This is also known as Tsutsugamushi or Japanese river fever or mite typhus. It is an acute febrile disease of Rickettsial origin. It is produced by *R. orientalis* and the vector

is a larval mite (chiggers), *Trombicula akamushi* from rats field mice and other wild rodents It has an incubation period of 4 to 12 days and febrile period lasting 2 to 3 weeks and is characterized by an initial lesion and adenitis.

The disease was first reported from Japan in 1878 and was named river fever or flood fever because it occurred along the course of rivers Its rickettsial origin was not discovered till 1929

Aetiology transmission—The rickettsial agent which is the cause of this disease is similar to *R prowa ke* and to *D rickets* though it is shorter and more diplococcoid the name of *R orientalis* and *R tsutsugamushi* has been given to it The infecting agent is only transmitted by the mite *T akamushi* in its larval blood sucking stage The larval mites take only one meal of blood in the day become infected field rodents (in Japan *Microtus montebelli*) The infection is pas... generation pass it on to man by their bit... Rickettsia can be isolated by inoculation in... cytoplasm of the interstitial cells or by ino... eye where it grows luxuriously in the... membrane The Rickettsiae can be demonstr... can also be propagated by intraperitoneal... has been lowered by vitamin deficiency C... recognized in different localities

Pathology—There is general vasculitis of the circulatory system as in spotted fever and typhus and the focal symptoms are due to the degree of involvement of the arterioles There is only a mild tendency to thrombus formation the damage being greatest in the heart lungs and brain (degenerative changes in the pons medulla and cerebellum) The viscera are generally congested and spleen is tremendously enlarged and the liver less so or may be normal in size Microscopically congestion cellular infiltration and parenchymatous degeneration is visible and is most marked in the heart and lungs

pects *Clinical aspects*—There may be mild prodromal symptoms such as headache malaise dizziness nausea, anorexia and photophobia during incubation (5 to 21 days) The onset is sudden and fever rises with shivering marked headache malaise conjunctival injection, photophobia insomnia, pain in joints hot flushes and chills and dizziness A local lesion at the site of attachment of the larval form of the mite is said to be characteristic of the disease in Japan and in most varieties of scrub typhus except rural typhus of Malaya The true local lesion of Japanese river fever is a sharply defined pustule 2 to 3 mm in diameter which ruptures and leaves a rounded ulcer (6 to 8 mm in diameter) with a black necrotic centre and surrounding red areola This local lesion at the site of the bite appears at the onset of the disease and persists throughout the illness It heals by granulation and leaves a permanent scar It is regarded by some not to be characteristic of this disease The eschar is painless and when not in an exposed part may be unnoticed by the patient

The ... the 4th and the 7th day of fever usually on about ... er form of spotted fever At first it consists of erythematous lesions (1 to 2 mm in size) which begins on the lateral aspects of the trunk and is it may spread to the scalp face palms soles and mucous membrane of the mouth The lesions do not itch nor are they painful After 3 to 5 days some time after 8 to 12 days they become light brown and scaly and finally fade away

The temperature rises daily each day in the beginning reaching 103 to 104°F (39.4 or 40°C) in 3 days there are morning remissions This is followed by more sustained and higher fever going up to 105°F (40.5°C) or even higher in fatal cases The temperature lasts for 5 to 10 days During this period all symptoms are at their highest There is severe post orbital headache nausea vomiting disturbances of the central nervous system producing insomnia delerium and twitching of the muscles the conjunctivae are inflammed and there may be hæmorrhages Pulse and respiration are usually raised in proportion to temperature (100 or more) but sometimes the pulse remains slow Leukopenia is present unless there are pulmonary complications A dry hacking cough may be present The spleen is enlarged. Severe prostration and exhaustion may occur serious cases show the highest temperature between the 10th and the 14th day The temperature falls by lysis during the last week of illness

In mild cases which occur in most of the other countries with the exception of Japan, the clinical picture is different. The local lesion may be absent or inconspicuous there is

no adenitis and the systemic symptoms especially those pertaining to the nervous system are milder The temperature attains its maximum quickly and falls rapidly after a few days Immunity is established earlier Skin eruption may be absent In such cases diagnosis is difficult to establish except by transmission to rabbits Defervescence may be slow or rapid in cases in which recovery occurs If the heart is not involved convalescence is uneventful

Immunity in this fever is not so lasting as in the cases with typhus or spotted fever Second attacks have been known to occur within a year Cross protection tests in guinea pigs and rabbits show that there is complete reciprocal cross immunity between the Malayan and the Japanese types of fever but not between this and other groups of Rickettsial diseases

Complicatio

Complications—Bronchitis and broncho pneumonia are the commonest complications and a respiration rate of over 30 per minute and pulse over 110 are danger signals Cyanosis may occur Cardiac failure is produced by myocarditis Less frequently gangrenous stomatitis suppurative pleural effusion adenitis and cystitis may occur

Diagnosis

Diagnosis—History of exposure to the mite and clinical signs and symptoms such as

Weil Felix test

giving characteristic response

Differential diagnosis from malaria is not difficult. Spotted fever, typhus measles typhoid have to be differentiated In mild and atypical cases rabbit inoculation test has to be done.

Prognosis—The mortality rate is high in Japan ranging from 30 to 60 per cent In malaya it is less the average being from 4 to 15 per cent. As in other Rickettsial diseases prognosis is better in children and when the local lesion and adenitis are absent When there is coexisting malaria or broncho pneumonia prognosis is not so favourable The general condition of the patient and the presence or absence of nervous symptoms are a good guide in assessing prognosis

(3) Treatment

Treatment

(3) *Treatment*—The Treatment is on the same lines as other Rickettsial diseases Rickettsia are present in the blood in early stages and therefore blood should be handled with great care on account of its infectious nature The principles of treatment are the same as those described under typhus or spotted fever Proper nursing and adequate nourishment are essential Immune serum therapy is in the experimental stage

Diet should be light and fluid intake should not be less than 3 000 ccm in 24 hours Codein ½ gr and asperin 5 gr alleviate headache Aureomycin in doses of 1 0 gm every 6 hours day and night is indicated It is advisable to give 100 mgm intravenously in a buffered solution to obtain the necessary concentration rapidly

Chloromycetin is given in initial doses of 50 mgm per kilo body weight divided into three parts *given at intervals of one hour The patient then receives* 250 mgm every 3 hours night and day for a period of five days after defervescence has occured Relapses may occur even after this treatment

General treatment is on the same lines as other Rickettsial diseases

During convalescence great care should be taken not to over exert as there is always a possibility of myocardial damage As soon as possible an electrocardiograph should be taken and if signs of damage are apparent prolonged rest is essential

Prophylaxis—Mites should be exterminated by clearing of jungle and by cultivating of land, mites inhabits damp grass in some countries and this should be burnt and reclaimed grass sprinkled with petroleum and creosote emulsion which kill the larval forms In Japan good results have been obtained by controlling floods Besides this much can be done by control of rodents Mite infested localities should be avoided if possible

Individual prophylaxis consists of wearing long trousers long boots or leggings long sleeve shirts closely buttoned at the wrists and well fitting collars Effective drug
these should
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shirts etc

One application is effective for a whole week Vaccination has not been tried on account of the short duration of immunity Cauterisation of the bite of the mite may be useful but sometime these are so numerous that it is not practicable

4 Q-FEVER

Q fever is a primary atypical pneumonia caused by a rickettsia *R burneti (R diaporica)* and was first reported from Queensland Australia in 1935 Cases have since been reported from various parts of the U S A and it is known as nine mile fever in Montana It also occurs in Central and South America and the Mediterranean region This Rickettsia resembles other organisms of this type morphologically and in its staining reactions It invades the cell nucleus and passes through Berkfield filters which do not allow typhus and spotted fever Rickettsia to get through The organism in infected tissues grows both intracellularly in mesothelial cells and also extracellularly It occurs in form of spherical clusters like *Bartonella bacilliformis* Although these organisms are not obligate intracellular parasites they are provisionally classed as Rickettsia

Epidemically the infection is believed to be conveyed to man by the bites of certain tick *(D andersoni)* which live in close association with certain animals such as cattle pigeons rats and mice and bandicoots (Isoodon torosus of Queensland) who are believed to be the natural reservoirs of the infection The mode of transmission is still obscure. in Australia *Hæmaphysalis humerosa* has been shown to the vector also *Ornithodoros gurneyi* Experimentally *O moubata* and *O hermesi* can also convey the disease

Pathology—There is pulmonary congestion and congestion and oedema with granular consolidation Microscopically the picture is one of atypical pnemonia

Clinical aspects—Two types of disease occur—(1) the type occurring among farmers and in slaughter houses and forests in Australia is tick borne and (2) in the laboratory workers in the U S A The incubation period is thirteen days or longer The disease
nsation sweating frontal headache weakness
a common symptom and may vary from a
mild abdominal cramps may be occasionally
ed spots may occur on the abdomen. It may

The average period of illness is four days but may last longer from one to three
week ation Patients
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more with [illegible] uous symptom
and muscle aches and pains respiratory and mild gastro intestinal symptoms are common Mental symptoms are not common but in some cases drowsiness and even stupor may occur

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Many features of Q fever have yet to be elucidated A number of strains of *R burneti* have been isolated from cases of pneumonitis and have been compared with other known strains and with one another In guinea pigs complete reciprocal cross immunity occurs between these strains and complement fixation and agglutination absorption tests indicate a similarity in immunological specificity The exact relation between the Australian Q fever and the viruses of atypical pneumonia found elsewhere however require further investigation

Complications—Insomnia prolonged anaemia and persistent weakness may occur

Diagnosis—The disease should be differentiated from atypical or virus pneumonia Weil Felix is negative with all proteus strains Specific rickettsial complement fixation test is obtained with patients and thus epidemic and murine typhus are excluded X ray of lungs is helpful Q fever can be definitely diagnosed by transmission to guinea pigs by intraperitoneal inoculation of blood or urine Once the infection is established in guinea pigs the Rickettsia are identified by staining with Giemsa The American strain is particularly pathogenic to guinea pigs and causes considerable enlargement of spleen *Diagnosis*

Prognosis—This is good in mild cases and convalescence is rapid *Prognosis*

Prophylaxis—Avoidance of tick and mite bites is necessary and otherwise the same precautions as for influenza should be taken It is possible that vaccination with killed Rickettsia may be useful *Prophylaxis*

5 TRENCH FEVER

This also known as Meuse fever Quintava fever Walhynia fever or five days fever It is a specific relapsing non fatal but disabling fever which is transmitted from man to man by the body louse *P humanus Var corpores* Its Rickettsial origin though probable has not been proved The initial attack may last from 2 to 25 days and is followed by relapses which may continue for several months Blood and urine may remain infectious for months

The disease was recognized in World War I when it occurred in Europe on both the fronts and was first included under the heading of 'pyrexia of unknown origin Its occurrence during the World War II was expected and cases occurred in different sectors

Aetiology—Typical fever was produced in human volunteers who were bitten by lice from patients suffering with this fever or when dried fæces of infected lice were rubbed into scarified skin Louse fæces remain virulent for months and extracellular Rickettsial organisms could be demonstrated in these Presumptive evidence in favour of this Rickettsia being the cause of trench fever is strong but absolute proof has not yet been furnished British and American authorities on Trench fever during World War I showed that the fever was transmitted by louse but did not obtain any evidence of trans-ovarial transmission The disease can be produced in man by injection of blood from infected patients *Aetiology and epidemiology*

Pathology—There is perivascular infiltration chiefly of lymphocytes but there is no infiltration of the intima of blood vessels and there is no thrombosis The causative organism occurs in the blood but is not intracellular *Pathology*

Clinical aspects—Prodromal symptoms such as headache, malaise and body pains may occur during the incubation period which is 10 to 30 days but the onset is sudden with chills, severe headache, anorexia and fever Severe tenderness and pains occur in muscles and bones particularly in the shins and back There is pain on rotating the eyeballs, and injection of the conjunctiva and photophobia are present

Rarely the onset is insiduous and the course is mild but prolonged neurasthenia and tachycardia being the main symptoms Temperature rapidly rises to 103° or 104°F and the fever may continue for 3 or 4 days or a week rarely it continues for several weeks Often the temperature may drop to normal on 3rd, 4th or 5th day but it goes up again and remains elevated for several days more Three to five relapses may occur Prolonged fever lasting for 2 or 3 weeks is met with Pulse follows temperature but marked tachycardia may occur Rash constantly occurs though it is irregular in appearance It consists of red macules 2 to 10 mm in diameter which blanch on pressure the rash appears with the onset of fever and lasts throughout the duration of fever The rash re occurs with relapses which often occur weeks and months later and are associated with all the original symptoms The course of this disease is variable and temperature is irregular and recurrent

Convalescence may be prolonged and is often accompanied by neurasthenia and functional disturbances of circulatory systems such as tachycardia and dyspnoea on exertion

Complications are as a rule absent A more or less permanent lumbar pain is common with the chronic type of disease

Diagnosis—The disease is often confused with influenza or other acute infections such as dengue and dengue like fevers brucellosis malaria relapsing fever (examine blood) etc. Lack of mental symptoms and toxicity differentiate it from typhus in the early stages In typical cases the diagnosis is not difficult and characteristic rash which appears early and the fact that the disease occurs in louse infected individuals are helpful In chronic cases fatigue neurasthenia and tachycardia clear diagnosis The early and abortive cases are difficult to diagnose

Prognosis—Fatalities practically never occur though the debility caused is prolonged and marked, ordinary work cannot be resumed for two months or so Relapses develop in about 5 per cent of cases and patient may take months to attain his normal health

(4) *Treatment*—Treatment on the same lines as Rickettsial diseases may be tried Aspirin phenacetine and in severe cases codeine are useful in allaying severe pains Morphine is not desirable but other hypnotics may be used to combat insomnia Patient should not be allowed to resume work for ten days or more even after a mild attack Relapses should be looked for and properly treated

Prophylaxis—This depends chiefly on delousing measures and louse control in the same way as in case of epidemic typhus Blanket and clothing should be put in autoclaves on account of the prolonged viability of the organism in the louse fæces People handling clothes should wear rubber gloves Urine and fæces of the patient should be disinfected. The infecting agent may persist in the blood for a year and such individuals should not be used as blood donors

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CHAPTER II

VIRUS DISEASES

GENERAL CONSIDERATIONS RECENT WORK ON VIRUSES VIRUS DISEASES VIRUSES AND IMMUNITY PHENOMENA—NEUROTROPIC VIRUSES THE EPIDEMIC GROUP EPIDEMIC ENCEPHALITIS ENCEPHALITIS LETHARGICA (VAN ENCOMAS DISEASES) JAPANESE ENCEPHALITIS B TYPE ST LOUIS ENCEPHALITIS EQUINE ENCEPHALITIS RUSSIAN ENCEPHALITIS THE SPARADIC GROUP ENCEPHALITIS WITH TRANSMISSION MECHANISM UNKNOWN—POLIOMYELITIS—RABIES—LYMPHOGRANULOMA VENERIUM—HERPES FEBRILIS—HERPES ZOSTER—PSITTACOSIS—INFECTIVE PAROTITIS (MUMPS)—YELLOW FEVER—DENGUE—PHLEBOTOMUS FEVER—TRACHOMA—RIFT VALLEY FEVER—INFLUENZA—INFECTIOUS CORYZA (THE COMMON COLD)—SMALL POX (VARIOLA ALASTRIM)—VARICELLA (CHICKEN POX)—PRIMARY ATYPICAL PNEUMONIA (VIRUS PNEUMONIA)

1 General Consideration

Nature of viruses

The word virus is used to designate certain agents of infectious disease that are not subject to study by the usual bacteriological procedures The nature and properties of viruses cannot be determined by the morphologic and cultural methods which are applicable to bacterial organisms Viruses cannot usually be seen by the ordinary microscope and so far they have not been cultivated outside the living tissues Till recent years they were only demonstrated by their powers to cause disease and special and new methods were required to study their nature and properties Intensive work during recent years on viruses of vaccinia equine encephalomyelitis influenza and rabbit papilloma by means of air driven analytical centrifugation of infected materials has enabled workers to obtain them in a sufficiently pure form to study their chemical and electron micrographic properties

Filterable viruses exhibit great variation in size ranging from 10 to 275 millimicrons Although most of the viruses pass through porcelain filters which retain bacteria the larger viruses pass with difficulty The larger viruses (*e g*, psittacosis) can even be seen with the ordinary microscope and can be stained in the same way as bacteria Most of the viruses can now be seen by means of electronic microphotographs

Characteristics of viruses

Viruses multiply in man and animals and they can also be cultivated in various types of tissue culture or in the yolk sac the chorioallantoic membrane or the embryo of a developing chick

The biologic characteristics of viruses may be considerably altered by passage through different species of experimental animals Viruses react differently to drying heat and chemical agents most of them are resistant to 50 per cent glycerol Poliomyelitis virus is resistant to low temperatures while that of lymphocytic choriomeningitis dies rapidly at 4°C When frozen and stored at minus 70°C some viruses retain their virulence for prolonged periods Most of the viruses are killed by exposure to a temperature of 55°C for 5 to 10 minutes, even at ordinary room temperature they do not survive long Phenol in 1 to 2 per cent strength destroys many of them

(1) Recent work on viruses

Size of viruses

As a result of extensive studies by various workers the size of the viruses can be seen by ordinary microscope and the smaller viruses have been rendered visible by the electron microscope Signs of unmistakable differentiation within particles and definite internal structures has been revealed in the larger viruses

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CHAPTER II

VIRUS DISEASES

GENERAL CONSIDERATIONS RECENT WORK ON VIRUSES VIRUS DISEASES VIRUSES AND IMMUNITY PHENOMENA—NEUROTROPIC VIRUSES THE EPIDEMIC GROUP EPIDEMIC ENCEPHALITIS ENCEPHALITIS LETHARGICA (VAN ENCOMAS DISEASES) JAPANESE ENCEPHALITIS B TYPE ST LOUIS ENCEPHALITIS EQUINE ENCEPHALITIS RUSSIAN ENCEPHALITIS THE SPARADIC GROUP ENCEPHALITIS WITH TRANSMISSION MECHANISM UNKNOWN—POLIOMYELITIS—RABIES—LYMPHOGRANULOMA VENERIUM—HERPES FEBRILIS—HERPES ZOSTER—PSITTACOSIS—INFECTIVE PAROTITIS (MUMPS) —YELLOW FEVER—DENGUE—PHLEBOTOMUS FEVER—TRACHOMA—RIFT VALLEY FEVER—INFLUENZA—INFECTIOUS CORYZA (THE COMMON COLD)—SMALL POX (VARIOLA ALASTRIM)—VARICELLA (CHICKEN POX)—PRIMARY ATYPICAL PNEUMONIA (VIRUS PNEUMONIA)

1 General Consideration

Nature of viruses

The word virus is used to designate certain agents of infectious disease that are not subject to study by the usual bacteriological procedures The nature and properties of viruses cannot be determined by the morphologic and cultural methods which are applicable to bacterial organisms Viruses cannot usually be seen by the ordinary microscope and so far they have not been cultivated out side the living tissues Till recent years they were only demonstrated by their powers to cause disease and special and new methods were required to study their nature and properties Intensive work during recent years on viruses of vaccinia, equine encephalomyelitis influenza and rabbit papilloma by means of air driven analytical centrifugation of infected materials has enabled workers to obtain them in a sufficiently pure form to study their chemical and electron micrographic properties

Filterable viruses exhibit great variation in size ranging from 10 to 275 millimicrons Although most of the viruses pass through porcelain filters which retain bacteria the larger viruses pass with difficulty The larger viruses (*e g*, psittacosis) can even be seen with the ordinary microscope and can be stained in the same way as bacteria Most of the viruses can now be seen by means of electronic microphotographs

Characteristic of viruses

Viruses multiply in man and animals and they can also be cultivated in various types of tissue culture or in the yolk sac the chorioallantoic membrane or the embryo of a developing chick

The biologic characteristics of viruses may be considerably altered by passage through different species of experimental animals Viruses react differently to drying heat and chemical agents most of them are resistant to 50 per cent glycerol Poliomyelitis virus is resistant to low temperatures while that of lymphocytic choriomeningitis dies rapidly at 4°C When frozen and stored at minus 70°C some viruses retain their virulence for prolonged periods Most of the viruses are killed by exposure to a temperature of 55°C for 5 to 10 minutes even at ordinary room temperature they do not survive long Phenol in 1 to 2 per cent strength destroys many of them

(1) Recent work on viruses

Size of viruses

As a result of extensive studies by various workers the size of the viruses can be seen by ordinary microscope and the smaller viruses have been rendered visible by the electron microscope Signs of unmistakable differentiation within particles and definite internal structures has been revealed in the larger viruses

such as vaccinia The latter, like the bacteria are antigenically complex and some of them are presumed to have complex chemical *structure similar to typical* bacteria The large viruses appear to have complex enzyme systems in case of vaccinia virus there is direct evidence in support of this while in case of viruses of lymphogranuloma venereum inclusion blennorrhœa the mouse pneumonia there is indirect evidence (Nigg and Eaton) which are sensitive to sulphonamides *All these facts leave little* room for doubt that whatever the environments in

protein having the pro[
mosaic disease on inoc
vaccinia and influenza

In spite of all the data thus collected some workers are still reluctant to abandon the conception of viruses being derived from the cells of higher animals or plants They suggest that viruses may be genes, which freed from their
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micrographs indicates morphologic characters of the agents very similar to those of the relatively highly organized bacteria but whether all viruses are of *similar nature remains to be determined*

of

T M Rivers believes that viruses may be heterogeneous and that while the large viruses like psittacosis are probably micro organisms the very small and simple viruses are non living things The consensus of opinion however is that the viruses present an unbroken series proceeding from the smallest and simplest to the largest and most complex and from them to the rickettsias and *there is no sign of fundamental difference between the members of the series* It therefore it is believed that the less complex viruses are derived from genes it will have to be presumed that more complex ones have also evolved from them it would be difficult to consider how and why the naked gene decided to clothe its nudity

The hypothesis put forward by Green and Laidlaw that viruses have arisen *from higher forms of* micro organisms by a process of progressive adaptation to a parasitic existence in which the parasite is reduced to a bare nucleoprotein molecule capable of self replication but relying on the host cells entirely for the necessary material and energy would appear to be more acceptable Burnet (1947) has accepted this view and considers viruses as micro organisms adapted *to a parasitic existence and capable like other living things* of producing variants—in point of fact highly endowed in this respect

According to Burnet human virus infections have been derived from similar condition in animals because for a parasitic organism to survive there must be sufficient opportunity for the transfer of infection *Epidemic typhus* has arisen from rodent typhus by the adaptation of the casual rickettsia to the

human body louse In psittacosis probably a similar process is going on and man may become a permanent host as there are cases in which virus has passed from man to man

There may also be changes in the host, though less important of an immunological or even social character Thus poliomyelitis in which the infection *comes from adult to children is now transmitted from child to child* the adults escaping

Changes in evolution

The viruses, in the course of their evolution, have undergone many fluctuations and virus variants of increased virulence have eliminated themselves since they destroy their hosts The host and parasites have become so adjusted to each other that infection is widespread and the host is not much troubled The herpes simplex virus is a typical example of this

Bacteria & viruses

Bacteria have also their virus enemies Bacterial cultures sometime clears suddenly and the bacteria appears to break up and dissolve A drop of this liquid added to another bacterial culture produces the same phenomena The agent which destroys the bacteria can be transferred from one culture to another and its activity increases with each transfer This phenomena is now recognised to be due to the bacteria virus now known as *bacteriophage* which can be definitely demonstrated by electron-micrographs The bacteriophage particles are of different types which differ considerably in size and shape Under the electron microscope the phage particles are recognised by their tadpole-like shape with short rod shaped tales The attack begins when 1 or 2 of these particles attach themselves to a bacterium and then pass through the cell wall into the body of the bacterium Here they multiply untill the whole of the interior appears to be filled with these particles The cell membrane then disrupts and the particles escape It has also been shown that if two or more virus particles damaged by ultraviolet rays enter the bacterium they multiply as well as the undamaged virus particles It would appear that 2 damaged particles can share their parts and make one complete individual between them It has also been shown that phage particles have about 20 independent units and a damaged unit in one can be made good from the other

(2) Virus diseases

Virus diseases are widely distributed in animals and plants and represent most destructive and rapidly spreading infections There are nearly 20 virus diseases occurring in man and one hundred in animals and some two hundred in plants In the following table some of the important diseases produced in man and animals are given.—

In man	**In animals**
Viruses attacking central nervous system	
Encephalitis lethargica	Rabies
Japanese B encephalitis	Encephalomyelitis
St Louis encephalitis (Mosquito borne)	Cow pox
Equine encephalomyelitis	Fowl pox
Russian spring summer encephalitis (Tick borne)	Fowl paralysis
	Foot and mouth disease
Poliomyelitis	Rinder pest
Rabies	Hog cholera
Herpes zoster and Herpes febrilis	Myxoma of rabbits
	(horses)

In man	In animals
Lymphogranuloma Venereum (rarely produces meningitis)	Wilt disease of caterpillar
Lymphocytic choriomeningitis	Sac brood of the honey bee
	Psittacosis

Other virus diseases

Small pox
Chicken pox
Influenza
Varicella
Dengue
Sandfly fever
Measles
Tracnoma
Molluscum contagiosum
Looping ill
Common cold
Psittacosis
Rift valley fever
Atypical pneumonia and acute infectious hepatitis may be of virus *origin*

Some virus *diseases are transmitted by mosquitoes e g* St Louis encephalitis Japanese B encephalitis equine encephalitis yellow fever and dengue Phlebotomus fly transmits sand fly fever Russian spring summer encephalitis is transmitted by a tick A vector once infected remains so for life

Viruses also produce disease in plants and some of these are —

Tobacco mosaic sugar cane mosaic peach yellow spindle tuber of the potato etc *The v ruses produce very serious damage to both the food and fibre* supply of man and present a very serious problem

Viruses are at present only known from the effects they produce They have not yet been properly recognized and classified into different groups Very little information is available about their distribution in nature their mode of infecting the portals of their entry into the body their level of infecting and many other matters in connection with their pathogenicity

Some virus diseases e g small pox are extremely contagious while others like poliomyelitis are of low infectivity They may occur in an epidemic form The transmission of infection from the sick to the healthy by means of insect vectors including sandflies ticks etc is illustrated by such disease as pappataci fever dengue and *yellow fever The epidemiology of certain forms of* virus disease remains yet obscure In herpes simplex the commonly held view is that the virus while normally present becomes active and produces its characteristic lesions only when the natural resistance of the body is reduced by some intercurrent infection (e g pneumonia common cold etc) A similar view has been held with regard to encephalitic sequelæ of measles chicken pox ... mall pox Season plays some part in the epidemiology of ... oliomyelitis is common in late summer while ... months

Virus and tissue cells—Viruses differ from bacteria in that they do not grow in the absence of living cells They grow in ordinary cells but they grow best in rapidly dividing cells in which they multiply rapidly and produce cellular prolifera tion and often destruction of the cell The changes produced in the cells by viruses in the course of their interaction with the host tissues are variable They sometime produce intracellular inclusion bodies within the infected cells which are larger than the individual particles of virus These inclusion bodies can be ... cytoplasm ... The ... viruses ... others believe they are a mixture of the two

Virus and ti... cells

These bodies are not seen in all virus infections but in such diseases as rabies they form a characteristic feature of the disease Large viruses such as vaccinia present elementary bodies within the cytoplasm which are regarded as particles of the infectious agent

(3) Viruses and immunity phenomena

The minute size of viruses and their intimate relation with tissue cells are important factors in connection with the development of immunity The bacterial organisms generally multiply on the surfaces of cavities in the body and specific immune bodies are developed which brings the invading antigen under the lytic action of alexin or sensitize it for the phagocyte It would thus appear that this mechanism is largely responsible for defending the individual against invasion by bacterial organisms

... immune serum even in large amounts in virus diseases for instance in poliomyelitis produces little alleviation of paralysis as destruction of nerve tissue has already taken place by the process of parasitising of these cells Such treatment will however, protect the cells which have not been invaded by the virus The therapeutic effects of immune bodies in the treatment of virus diseases are mostly confined to treatment of contact exposures or early developing cases as it inactivates the virus before it becomes anchored to the cells within which it multiplies This is the reason why convalescent serum is so useful in early cases of measles

Production of Immunity

Some of the virus diseases confer a life long immunity to the host e g yellow fever small pox In others the immunity produced is transitory The immunity is specific and immunity against one disease does not protect against another disease Cow pox virus inoculated into a man however gives a lasting immunity against small pox but then cow pox is probably a modified small pox the small pox virus having been changed and by passage through the cow it ... immune to the fatal ... of first come first ... is produces a lasting

immunity In order to produce a lasting immunity the presence of a living virus is necessary and it is surmised by many authorities that the immunity which is produced in rabies is due to the active virus and that the dead virus is ineffective. Killed vaccines have, however, been used with success in immunising horses and mules against equine encephalomyelitis Pasteur fixed the street virus of rabies and attenuated it by drying, in this way Pasteur practically applied the same principle as Jenner did in case of small-pox vaccination In case of yellow fever the virus is modified by passage through brain of the mouse and thus an effective vaccine is prepared against yellow fever in man Similarly fowl pox virus is attenuated by passing through pigeons and thus an effective vaccine is prepared against virulent fowl pox infection It is thus obvious that one means of controlling deadly virus diseases is by producing active immunity

Some viruses although immunologically different produce the same disease e g, in influenza two immunological different strains and in equine encephalomyelitis three strains and in foot and mouth disease four strains produce in each only one clinical form of disease

with ses *Immunity productions*—An effective and lasting immunity has been found to develop after an attack of certain virus diseases such as small pox chicken pox yellow fever, etc. The immunity in some cases appear to last throughout life but in some diseases, e.g herpes simplex and influenza, this immunity is not well developed Certain essential differences are said to exist between infections with a virus and bacterial infections, but it is probable that the mechanism of virus infection does not materially differ from that [illegible]

certain parts and to produce characteristic inclusion bodies in certain cells which may ha e a bearing on the nature of immunty development

immunity Immunity to virus dise [illegible] conferred by the administration of [illegible] t duration Attempts have be[illegible] convalescent human serum [illegible] on the other hand is nearl[illegible] artificially induced The lat[illegible] virulent virus, or a virus t[illegible] host, or a fully attenuated [illegible] until virulent virus can be [illegible] injection of the killed viru[illegible] used in rabies Similarly th[illegible] diseases in animals with va[illegible] cattle plague, formolized va[illegible] and psittacosis by injection [illegible] affo[illegible] of i[illegible] varc[illegible] e antigenic value of some of the viruses subj[illegible] the living virus after partially immunizing The [illegible] an antiserum. For the latter an effective the [illegible] ith virus and antiserum that is virus into method is the so ca[illegible] one site and serum nto another Successful vaccination is generally indicated by a generalized reaction It may also be produced by administering the antiserum after the injection of the living virus and this is the method adopted at the present time in the prophylaxis of measles

The mechanism of antiviral immunity is imperfectly understood. The fate of a virus when introduced into an immune animal is not known. Experiments so far made go to show that the viruses concerned in the production of diseases have special affinity for some tissues and are found there in greatest number. Vaccinia virus is found in the highest concentration in the lymph of the pustules, the virus of foot and mouth disease

an mals

The nature of the reaction that occurs in the blood in the production of immunity is still controversial. Most of our knowledge in this connection is derived from the work that has been done with vaccinia virus. The virus-containing material from the pocks ... itation reactions ... l that the tissues ... od es, which are ... line have been ... ti herpes serum ... fever virus and

Diagnosis and treatment of virus infection.—Diagnosis of virus infections is made by isolating and identifying them by various methods devised and by demonstrating the specific antibodies produced by them. *Diagnosis*

So far as the prophylactic and treatment of virus diseases is concerned, little information is available at present. Until we know the portals of entery of a virus into the body, how the infection travels to the particular cells, which is going to be invaded, how it multiplies and how it is excreted from the body of one host and gains entrance into another, further advance in therapy cannot be expected. *Treatment*

2. Neurotropic Viruses

Some viruses attack the central nervous system and the group of diseases caused by them cannot be diagnosed on clinical grounds, though their seasonal incidence, geographical distribution and epidemiological characteristics may be helpful. The isolation of the virus and serological reactions are the only factors by which a definite diagnosis can be made. Three groups of these diseases have been differentiated:—

(1) *The epidemic group*

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equin ...
B en ...
these ... rise in mosquitoe population brings about an epidemic. Birds and small rodents are probably the natural reservoirs. The epidemic attains its maximum in late summer and rapidly falls in temperate climates in cold weathers. Russian

(2) The sporadic group

It comprises of rabies and lymphocytic choriomeningitis

Lymphocytic ... virus occurs in ... contact Res... stiffness of neck ... ratory system only The most important finding is cell count of over 1000 cmm in spinal fluid Diagnosis can only be made either by isolation of virus from the blood or spinal fluid in early febrile period or presence of complement fixing antibodies during convalescence

Besides these there are post infection encephalitis which may follow after vaccination against small pox or rabies or after such acute diseases as measles mumps and chicken pox which are also included in this group It is doubtful whether these are due to virus infection they are not transmissible The lesions produced are not inflammatory but degenerative in nature The clinical picture is the same as epidemic encephalitis and diagnosis is based on association with preceeding infection or vaccination against small pox or a course of antirabic treatment

(3) Encephalitis with transmission mechanism unknown

Encephalitis lethargica (Economos disease) and poliomyelitis belong to this group The former has already been described

3. Poliomyelitis

Poliomyelitis is an acute disease of childhood and adolescence caused by a filterable virus, but it may occur at any age The clinical signs of invasion may be so slight as not to be observed and especially in the tropics in many cases no untoward effects are produced Occasionally the disease occurs in paralytic form It is characterised by fever, malaise, restlessness and gastro intestinal symptoms such as diarrhœa and vomiting (which may or may not be present) This stage may be followed by a period of 12 to 48 hours in which symptoms are absent but these return Paralytic stage may develop without intermission the principal changes occurring in the anterior horns of the spinal cord The incubation period is one to two weeks

fluid of man

Fifty to 75 per cent of cases in America occurred among children under five years of age more cases occur among females than males The routes of infection in man is uncertain but probably there are many as the virus has been found in the nasopharynx ... The virus is transported ... s cylinders are the route ... e late summer and early ... gnancy tonsillectomy etc ... ase

The virus has a world wide distribution but in tropical climates it appears in paralytic form more rarely than in temperate climates The prevalence of the disease can be determined by serum neutralization survey test

In paralytic cases the main lesion is necrosis of the cells of anterior horn of the spinal cord along with generalized meningeal reaction, perivascular infiltration with predominantly mononuclear cells The motor neurons of the cord and midbrain are specially affected,

the degeneration of the neurons is accompanied by oedema infiltration of leucocytes and proliferation of glial tissue Lesions may occur in the white matter of medulla, pons, midbrain and the cortex. Hyperplasia of lymphoid tissue may occur in the body in some epidemics; submucous hæmorrhages may occur in the stomach; leucocytosis up to 30000 is present.

Clinical sym

In sub-clinical infection the patient may not show any symptoms at all and these are

signs of involvement of the cord or the meninges In pre-paralytic cases signs of meningeal involvement may appear but no paralysis The temperature rises to 103 or 104°F, the child is irritable, there is headache, drowsiness, pain in the back, stiffness of spine and neck and Kernig's sign may be obtained In a few hours to a day the temperature may fall the child may regain normal health.

Diagnosis

Diagnosis can be made by characteristic changes in spinal fluid The prodromal stage lasts 2 to 3 days, the pre paralytic 1 to 2 days and the paralytic 1 to 2 days The virus persists in the stools for a few days after the attack and sometime for 2 or 3 months

In paralytic cases prodromal symptoms occur just the same as in non-paralytic cases. Before the nervous system is involved the symptoms may be prodominantly respiratory (sore throat cold in head) or gastro intestinal (diarrhœa vomiting abdominal pain and later constipation), there is flushing of face, irritability and temperature of 101°F or more When asked to sit up the patient pushes himself up with hands and supports himself with arms at the sides or back when in sitting posture Flexion of the head and back towards the knees is resisted, tendon responses become irregular, superficial reflexes are lost and Kernig's sign is present, The onset of paralysis is sudden but is frequently preceeded by pain and tremors in muscles

The paralysis is either bulbar or spinal in origin, the latter is more common but the two may co-exist The respiratory centre in the medulla may be involved, or the pharyngeal muscles may be paralysed leading to choking or the diaphragms and the intercostal muscles may be paralysed Most of the fatalities are due to paralysis of respiratory muscles Speech may be affected and ocular muscle or the facial nerve may be involved. In the spinal type there is paralysis of muscle of the limbs The paralysis may be of ascending type appearing first in legs and rising progressively to involve abdominal and back muscles, the patient dying of respiratory failure The paralysis may rise up in jumps there being intervals of 12 hours or so between paralysis of different groups of muscles The affected muscle remains painful and tender for 5 or 6 weeks, they are flaccid and waste in due course.

Recovery occurs more completely in the bulbar type than in spinal type but even in the latter the muscle regain much of their function extensive paralysis may be present. Relapses have been known to occur 2 or 3 months or even a year after the original attack.

Prognosis

Prognosis is good unless respiratory muscles are affected Sequelae in form of permanent paralysis contractures and deformities may persist.

This is often difficult in sporadic cases in the tropics but in an epidemic it is often possible to diagnose by clinical symptoms alone Examination of spinal fluid is helpful if meningeal signs are present The fluid comes out under increased pressure, is almost clear although the cell count is increased from 25 to 500 per cent, the mononuclear cells are predominant, though in early stages polymorphonuclear cells are larger in number, sugar content is normal but globulin is increased Neutralization test with serum of acute and convalescent patients on mice inoculated with adapted strain of virus may be helpful Inoculation of monkeys with fœcal material or discharges from pharynx may be tried

Differential diagnosis is to be made from post-diphtheric paralysis neuritis syphilitic conditions tick bite paralysis, etc.

Treatment

There is no specific treatment, serum therapy is entirely valueless Many drugs have been tried to prevent paralysis but are useless Local treatment of nasopharynx and throat is not of any value In acute stages complete rest in bed and immobilization of the affected parts is essential Kenny's treatment consists of relieving spasm of muscle by hot fomentations with blankets wrung out in boiling water, this prevents contractures and deformities

When respiratory muscles are involved mechanical respirators such as 'Iron lung' may be used as soon as signs of weakness of these muscles appear. Drinkers respirator is metal cabinet in which the patient lies supine, only the head protruding through a rubber collar. Alternate positive and negative pressures are produced at appropriate rythm by means of a motor. Brigg Paul respirator is a simpler device for the same purposes which is attached on to the chest. This is kept up till the ascending paralysis is checked and muscle start working. The writer has known of a case which had to be kept in an iron lung for nearly a year and eventually completely recovered. In cases of paralysis of the respiratory centre these devices are useless.

During acute stage when tenderness and pain persists no active treatment should be given and patient should have perfect rest and relaxation of the affected parts. Active local treatment should be given during convalescence but active and passive movements and massage should not be started till 3 or 4 weeks after when all pain and tenderness have disappeared. Re education of muscles is most essential and has to be carried on for long periods. If spinal muscles are weak the child should not sit up. For totally paralysed muscle massage is very important. With less weakened muscles more active movements are necessary. Massage is not a substitute for active movement and these should be systematically carried out.

It has been shown that wasting is not averted nor is necessary. In acute stage diathermy electrically produced is applied to the parts and is said to improve circulation and recovery of the function of muscles but this has not been substantiated. Local heat however, helps to improve circulation of paralysed limbs till active movement is restored. Physical training of a case of poliomyelitis may have to be carried on for years.

Second attacks in man are rare though they do occur. Monkeys after vaccination show antibodies but they readily contract the disease after intra cerebral inoculation. Infants under six months do not get the disease probably due to the transmission of antibodies through the placenta.

Vaccines are dangerous and useless. Very little can be done by way of treatment of naso pharynx with antiseptic sprays. Protection with antiserum is not of practical value in a disease such as this as it is of very short duration.

4 Rabies

Rabies or hydrophobia is a virus encephalitis met with in dogs and other animals. *It is usually transmitted to man and animals by the bite of rabid animals whose saliva contains the filterable virus.* The disease is also transmitted *through* exposure of an injured nerve as in a wound open sore or abrasion of skin and mucous membrane. The incubation period averages 6 to 8 weeks but may vary ... stage hyper irritability ... ive only about a week ... mited

Rabies has a world wide distribution but is especially common in those tropical and subtropical areas where wild dogs and jackals are found in large numbers. Cats, wolves and other animals may rarely carry infection, it is very rare in rats. The disease may break out in epizootic proportions after long quiescent period. It is very prevalent in a specially virulent form all over India and is spread through the bites of wild dogs wolves jackals and domesticated animals. In South America the disease is widespread and cattle

are very commonly infected. An unusual form of the disease is encountered in Jamaica, where the vampire bat plays an important part in spreading the disease The bats are said to often survive an attack after which they may become carriers for varying periods

Man is probably less suceptible than dog though in man most of the bites suffered are superficial through the clothes and on the extremities Rabies in man is thus a comparatively rare disease than in such animals as dogs, jackals, etc

Place of occu

The disease is enzootic or epizootic in many parts of the world, though some countries are free from it, e g, Denmark, Norway and Sweden In England the disease has been completely stamped out as a result of strict quarantine measures and it is also absent from Australia In the U S A the disease is still encountered in some areas, but has now been eradicated from most of the territories of that country

Street virus

There are two recognised strains of the rabies virus The *street virus* being the strain isolated from the natural infection and the *fixed virus* which is a strain modified from the street virus by a series of successive passages through rabbits The street virus was simply the infective agent of rabies, which is met with in the infecting fluids or tissues [illegible] sibility [illegible] disease [illegible] lations [illegible] period [illegible] This was called 'fixed virus' by Pasteur At this stage the virus has become fixed and permanent and the change is an irreversible one The essential differences are its reduced pathogenecity for m[illegible] of the incu[illegible] ing fixed, [illegible] tissue, and [illegible] Remlinger [illegible] to that in [illegible] the disease, once produced, whether by the street or fixed virus

Fixed virus

Size of virus

The size of these viruses varies between 100 and 150 millimicron being of intermediate size among viruses, it can pass through Berkfeld filters not finer than 1-3. The virus is sensitive to heat and is destroyed by exposure to a temperature of 50°C for 1 hour It can withstand intense cold and is not destroyed by 50 per cent glycerine for many months Rapid drying does not destroy the virulence of the virus and it can be preserved after such drying in stoppered bottles in the dark for as long as nine months Gradual drying causes a gradual attenuation of the organism which loses its virulence in 5 or 6 days. Although a neurotropic virus it is frequently demonstrated in the salivary glands and saliva.

As a result of inoculation through the bite of the rabid animal the virus is generally believed to enter the nerve endings and torn nerve fibres, and travels up the axis cylinders to the central nervous system Here the virus enters the nerve cells of the brain and multiplies After an initial stimulation these cells are finally destroyed A neurotoxin is also produced Some workers consider that the main route of travel of the virus is via the lymphatic channels

In animals and man the virus tends to concentrate more in certain areas than in others Thus in infected rabbits the brain cortex is highly infective while the medulla is five times more virulent than the rest of the spinal cord The salivary glands of dogs contain the virus which may be discharged in the saliva for a few days even after recovery In man the virus rarely occurs in the salivary glands The virus has not been found in blood which is, therefore non-infectious

Pathological changes

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itself, a degeneration developed around the parasite or reaction on the part of the nucleus of the nerve cell to the parasite It is found most constantly in the ganglion cells of the cerebral cortex chiefly in the hippocampus major which is now regularly examined for the diagnosis of rabies. There may be one or more bodies in the cell, they vary in size from

1 to 15 and contain within a capsule 20 to 25 rounded bodies in the centre of each of these bodies is a corpuscle The Negri bodies are more prominent in the later stages of the infection progressively diminishing in size as the street virus becomes transformed into the fixed virus until they finally disappear The position as to the true nature of the Negri body was judiciously summed up at the International Conference on Rabies where the decision was reached that insufficient evidence existed to determine whether the Negri body was a parasite or merely a cell product

The incubation period is remarkably long and extremely variable and is influenced by a number of factors prominent amongst which are the species of animal involved and the site of inc

and short

period I

in males

The incubation period is rarely less than ten days or longer than 3 or 4 months though it has been known to have extended up to 1 year During this period no symptoms occur except perhaps psychic phenomena due to fear of disease

Rabies in man pursues a similar course as in dog except perhaps that furious form in dog is represented by spasmodic form in man Two distinct clinical types are generally recognized The furious or excited type and the dumb or paralytic type

ymptoms *The furious or excited type*—This type is usually ushered in by anxiety depression ... lessness The wound ... develop There ... starts with th s symptom An early symptom is spasm of the muscles of deg ... xcessive amounts of ropy mucus may drip from the mouth or it may be churned to a froth by spasm of ... he patient frequently suffers from very painful laryngeal spasms which

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Hydrophobia is perhaps most characteristic symptom of the disease and is prese t in most cases It consists of agonizing painful spasms of the laryngeal muscles and muscles of *deglutition*, which are brought about whenever the patient attempts to eat or drink, especially the latter Respiratory spasms originating in the thoracic muscles are also met with and the reflexes are generally exaggerated The patient may become violet and may damage articles of furniture but there is little tendency to attack fellow human beings

bia

ype *The dumb or paralytic type*—In this form it is believed that the main involvement affects the sp nal cord and not the brain The disease starts with high fever, headache and vomiting and the site of the bite becomes at first inflammed and painful and later numb The period of excitement is short ataxia weakness and paralysis develop early and affect the region of inoculation first and later spread to the limbs trunk face tongue and eye muscles The rectal and urinary sphincters are also paralysed There is usually no hydrophobia and death occurs from heart failure in a week or so

logs *Rabies in dogs*—Dogs are usually affected by the paralytic form of the disease The animal suddenly shows a change in its temperament and may show excessive affection or become sullen and irritable it is startled by the slightest noise and barks at the slightest provocation Other animals or human beings may be attacked and bitten if they come in its way but it will not go out of its way to attack The gait is often uncertain and one ear may seen to be drooping Finally convulsions appear get more intense and death soon releases the victim from its suffering

This is based on the history of bite and typical clinical symptoms Animal inoculation test may be used For microscopic examination of the brain of a rabid animal fresh unpreserved brain tissue is required the animal if experimental should be killed in such a way that no injury to the brain is produced The whole head of suspected animal should be sent placed in a water tight container and packed in ice (not dry ice as freezing of bra n tissue prevents staining of Negri bodies)

For staining Negri bodies Van Gieson s stain (aqueous mixture of methylene blue and rose aniline violet) is best ... the Negri bodies does not exclude rabies ... ase of animals treated with antirabic ... ingitis encephlitis and poliomyelitis.

The treatment is merely symptomatic to relieve the suffering of the patient as there is no drug known which can cure the condition When symptoms have set in the patient should be removed to a dark room and protected from all disturbing influences such as draughts of air sharp noises and light. The diet should be liquid dysphagia is always marked and recourse has to be had to nutrient enemas To control the paroxysm hypodermic injections of morphine or hyoscine or chloral hydrate by month may be given milder antispasmodics are of no avail atropine is said to return spasm Inhalations of chloroform give more relief than many antispasmodic drugs Forcible restraint during the paroxysms is often required *Treatment*

Antirabic serum —Antirabic serum has not proved successful in the treatment of rabies in man In animal experiments after removal of cerebrospinal fluid by occipital puncture and introduction of rabicidal serum by the same route *Antirabic serum*

toxin It is yet in the experimental stage

It is natural only in cold blooded animals and may be acquired in susceptible animals by *treatment with attenuated virus This can be conferred prior to* infection or during the incubation period after the infection Pasteurian treat

immunization in rabies is hardly of any value and hence it is doubtful whether antirabic serum has any antitoxic character Such serum however has been used in conjunction with antigen as a sero vaccination method of treatment

General measures consist of enforcing restrictions on dogs Stray dogs should be impounded or destroyed Pet dogs should be registered muzzled and vaccinated All bites should be reported adequately treated dog or any other animal concerned should be carefully watched under strict control

Cauterization of the bite wound with cautery or fuming nitric acid was used as a prophylactic measure it is painful disfiguring and considered by some to be of doubtful value There is experimental evidence however that even if the infection i *Cauterization of bite wound*
time for
should be
of mercur
suspicion
without delay

The practitioner has often to decide whether to give antirabic treatment or not in case of a dog bite If there is no doubt about the animal which has inflicted the bite being rabid the treatment should be immediately started In doubtful cases if the dog is a domestic animal and can be watched for ten days the treatment may be deferred Some dogs get into the habit of biting strangers although they are perfectly healthy Sometime a stray dog after a bite disappears If it has bitten a number of persons that is presumptive evidence of its being rabid and a course should be started If there is no such evidence it is difficult to

1 to 15 and contain within a capsule 20 to 25 rounded bodies, in the centre of each of these bodies is a corpuscle The Negri bodies are more prominent in the later stages of the infection is the street virus becomes transformed into the fixed The position as to the true nature of the Negri body w iternational Conference on Rabies, where the decision w existed to determine whether the Negri body was a pa

The incubation period is remarkably long and extremely variable and is influenced by a number of factors site of inoculation and shorter the dist period In females in males and adults respectively

The incubation period is rarely less than ten days or longer than 3 or 4 months though it has been known to have extended up to 1 year During this period no symptoms occur except perhaps psychic phenomena due to fear of disease

Rabies in man pursues a similar course as in dog except perhaps that furious form in dog is represented by spasmodic form in man Two distinct clinical types are generally recognized The furious or excited type and the dumb or paralytic type

ymptoms *The furious o* strange apprehensi becomes engorged may be a sensatic symptom An ear of ropy mucus m the jaw muscles, the patient frequently suffers from very painful laryngeal spasms which are characteristic of this disease The signs of cerebral irritation gradually progress, the slightest stimulus brings about spasms Delusions and hallucination develop, anxiety progresses to acute mania Patient lies quietly between attacks and after 2 or 3 days paralysis develops, the disease generally terminates fatally within 2 to 10 days

pe

bia Hydrophobia is perhaps most characteristic symptom of the disease and is present in most cases It consists of agonizing of *deglutition,* which are brought at especially the latter Respiratory spa with and the reflexes are generally may damage articles of furniture but

ype *The dumb or paralytic type*—In this form it is believed that the main involvement affects the spinal cord and not the brain The disease starts with high fever, headache and vomiting and the site of the bite becomes at first inflammed and painful and later numb The period of excitement is short ataxia weakness and paralysis develop early and affect the region of inoculation first and later spread to the limbs trunk face tongue and eye muscles The rectal and urinary sphincters are also paralysed There is usually no hydrophobia and death occurs from heart failure in a week or so

logs *Rabies in dogs*—Dogs are usually affected by the paralytic form of the disease The animal suddenly shows a change in its temperament and may show excessive affection or become sullen and irritable it is startled by the slightest noise and barks at the slightest provocation Other animals or human beings may be attacked and bitten if they come *in its way but it will not go out of its way to attack* The gait is often uncertain and one ear may seen to be drooping Finally convulsions appear get more intense and death soon releases the victim from its suffering

This is based on the history of bite and typical clinical symptoms Animal inoculation test may be used For microscopic examination of the brain of a rabid animal fresh unpreserved brain tissue is required the animal if experimental should be killed in such a way that no injury to the brain is produced The whole head of suspected animal should be sent placed in a water tight container and packed in ice (not dry ice as freezing of brain tissue prevents staining of Negri bodies)

For staining Negri bodies Van Gieson's stain (aqueous mixture of methylene blue and rose aniline violet) is best It must be understood that failure to demonstrate the Negri bodies does not exclude rabies These bodies are more difficult to demonstrate in case of animals treated with antirabic vaccine Differential diagnosis from tetanus meningitis encephalitis and poliomyelitis.

The treatment is merely symptomatic to relieve the suffering of the patient as there is no drug known which can cure the condition When symptoms have set in the patient should be removed to a dark room and protected from all disturbing influences such as draughts of air sharp noises and light The diet should be liquid dysphagia is always marked and recourse has to be had to nutrient enemas *Treatment*
hyoscine or chloral
of no avail atropi
more relief than
paroxysms is often required

Antirabic serum —Antirabic serum has not proved successful in the treatment of rabies in man In animal experiments after removal of cerebrospinal fluid by occipital puncture and introduction of rabicidal serum by the same route *Antirabic*

toxin It is yet in the experimental stage

It is natural only in cold blooded animals and may be acquired in susceptible animals by treatment with attenuated virus This can be conferred prior to infection or during the incubation period after the infection Pasteurian treatment is therefore both a prophylactic and curative treatment Pasteur's original desiccated cord treatment for production of immunity is hardly used now With the recent discovery that the dead virus forms as effective a vaccine as the living virus carbolised or etherised cord has been employed The great advantage of the dead virus vaccine is the elimination of neuroparalytic accidents Passive immunization in rabies is hardly of any value and hence it is doubtful whether antirabic serum has any antitoxic character Such serum however has been used in conjunction with antigen as a sero-vaccination method of treatment

General measures consist of enforcing restrictions on dogs Stray dogs should be impounded or destroyed Pet dogs should be registered muzzled and vaccinated All bites should be reported adequately treated dog or any other animal concerned should be carefully watched under strict control

Cauterization of the bite wound with cautery or fuming nitric acid was used as a prophylactic measure it is painful disfiguring and considered by some to be of doubtful value There is experimental evidence however that even if the infection is not prevented cauterization prolongs the incubation and allows more time for the development of immunity by antirabic inoculation A dog bite should be allowed to bleed freely and then washed with a 1 in 1 000 perchloride of mercury solution and cauterized with strong nitric acid If there is any suspicion that the dog is rabid the patient should be given antirabic treatment without delay *Cauterization of bite wound*

The practitioner has often to decide whether to give antirabic treatment or not in case of a dog bite If there is no doubt about the animal which has inflicted the bite being rabid the treatment should be immediately started In doubtful cases if the dog is a domestic animal and can be watched for ten days the treatment may be deferred Some dogs get into the habit of biting strangers although they are perfectly healthy Sometime a stray dog after a bite disappears If it has bitten a number of persons that is presumptive evidence of its being rabid and a course should be started If there is no such evidence it is difficult to

ission The disease is transmitted by sexual intercourse and accidentally by other routes such as by use of an enema syringe with fresh discharge from active lesions in the rectum physicians and nurses have been infected by handling infective material The virus has not been detected in the semen and it is believed that infection in women occurs from the presence of open lesions on genitalia of the active male partner Children have been infected by sleeping in the same bed with infected persons Infection is said to have occurred through the mucous membrane of the upper respiratory tract and through hands The disease occurs in places where the incidence of gonorrhœa and syphilis is high and the inguinal form occurs in the tropics as a climatic bubo especially among coloured races.

eristic The characteristic lesion in the male is in the lymphatic glands of the groin the primary lesions being a transitory small, painless papule or ulcer extension occurs to the deep iliac glands In the groin abscess is formed with a central area of necrosis containing many polymorphonuclear leucocytes round this there is a zone of macrophages and round these are lymphocytes There is no caseation nor are any bacteria demonstrated in sections of glands or by culture Fibrosis occurs round the glands and the drainage through the glands is closed through the activity of the virus this produces elephantiasis of the part drained commonly of labia scrotum and penis which is histologically undifferentiable from ordinary elephantiasis

In the female inguinal glands are not commonly affected, but there is inflammation of lymphatic glands in the rectovaginal septum leading to lesions in the rectum and lower portion of the sigmoid.

Besides lymphatic glands other tissues react by formation of granulation tissue with polymorphonuclear cells macrophages lymphocytes and plasma cells in its meshes Organisation of fibrous elements leads to fibrosis of the affected parts There is ulceration and cicatrisation of external female genitals the formation of perineal sinuses and fistulas take place especially when the rectum is involved.

The blood may show leucocytosis in the acute stage of disease of inguinal area, and secondary anæmia occurs in chronic cases Total serum proteins may be increased to 11 or 12 per cent reversal of albumin globulin ratio may occur

Symptoms This disease may appear in asymptomatic and symptomatic form The asymptomatic form appears exclusively in persons who have suffered from other venereal diseases and is more common than the symptomatic form The following stages occur in the symptomatic form —

Incubation period is probably only a few days the primary lesion is a small painless papule vesicle or ulcer which may not be noticed it usually disappears within a week of coitus and may be situated on the penis vaginal wall or cervix uteri

The secondary stage begins insidiously and is manifested by the inguinal disease which begins 1 to 3 weeks after coitus There is tenderness and enlargement of the glands which may be unilateral or bilateral the overlying skin is red and œdematous Fever chills and sometimes fleeting pains in the joints appear at this stage The enlarged glands may recede slowly after some weeks or may become matted soften and discharge pus In septic cases the spleen and liver become enlarged Formerly the buboes used to go on discharging pus for months and years but since the introduction of sulphonamide drugs sinus formation does not occur

In the female there are often no localizing symptoms before the involvement of rectum and passage of blood in stools The constitutional symptoms appear in form of headache malaise fever anorexia abdominal cramp and secondary anæmia Arthritis of the shoulder elbow and wrist joints may occur (in 10 per cent) in long standing cases

The third stage of the disease is most commonly met with in the females There may be proctitis with or without stricture anal fistula perirectal abscess In cases with stricture a firm band of fibrosed tissue which can be felt with finger encircles the lumen of the gut. The external genitalia are affected in the female occasionally *ulcerating* an[d] ... clitoris an[d] ... penis ... which ... oduce ... mation ... rely b

Relapses rarely occur in cases ... f clinical symptoms Bloody anc ... ionths of freedom from symptoms ... arely infection may occur throug ... nd arthritis and involvement of cervical glands *Relapses*

Complicat ons occur in form of stricture of the rectum wh ch may lead to complete bstruction Rarely pus may track up long distances and produce perinephric and even ubdural abscess *Complication*

The inguinal bubo has to be differentiated from those occurring in ambulant plague yphilis and chancroid infection In syphilis the glands are hard discrete and not matted ogether and there may be scars of primary lesion Rectal and colonic lesion may be onfused with fistula due to other causes

Frei s Test

Antigen is commonly prepared from brains of infected mice a 13 per cent suspension of which is inactivated by heating in the above described manner

Elementary bodies of lymphogranuloma can be obtained by growing it in the yolk sac of the developing chick embryo A very sensitive antigen can be prepared from this by suspending the material (1 in 200) in normal saline

The test is performed by inject ng 0 1 ccm of the antigen intradermally and observing the reaction after 48 or 72 hours In pos tive cases a central papule or induration appears capped with a vesicle or pustule and surrounded by a zone of erythema The papule may take several weeks to subside It should be borne in mind that a positive test may be due to an earlier infection and may have nothing to do with the symptoms present

A complement fixation test has also been evolved and a close relationship between the viruses of this d sease and psittacosis and meningopneumonitis has been demonstrated

D fferential diagnosis has to be made from chancroid (*H ducreyi* found in films) gonorrhœa, syphilis granuloma ingu nal (L D bodies found in smears) bubonic plague, carcinoma of rectum tuberculous d sease of rectum ulcerat ve colitis and chronic dysentery

Prognosis—It is good as regards life Deaths very rarely occur and are due to extension of infection to kidney region or spinal meninges Fatal hæmorrhage may occur from involvement of a large blood vessel. If treated with sulphonamide drugs the prognosis is excellent *Prognosis*

Before the use of sulphonamide drugs antimony compounds such as Fuadin were tried according to some with success, others consider antimony had no *Treatment*

be started early and should be intensive and prolonged in order to prevent relapses Sulphanilamide, sulphathiazole and sulphadiazine are all effective but the last named is the drug of choice. The drugs are given in doses of 1 0 to 1 5 gm three times a day for two to three weeks in accordance with the clinical response obtained A single course along with aspiration of pus will cure the early inguinal disease

Proctitis readily yields to sulphonamide therapy and cases without stricture are quickly brought under control and heal up In long standing cases prolonged treatment has to be given for a year or so with periods of rest of 2 or 3 weeks in between the courses

In cases with sinuses and fistulæ surgical measures should be combined with sulphonamide therapy Fibrous stricture when formed cannot be cured by any form of drug therapy and should be dealt with surgically

plaster or blister, allays symptoms Small doses of X rays to the affected area sometimes give considerable relief If the eye is affected cold boric acid compresses and irrigations are given several times in the day and a 2 per cent solution of atropine sulphate is put in the eye twice daily For persistant after pains iodide and aspirin and diathermy and radiant heat are recommended

Recently aureomycin in doses of 50 mgm per kilo daily divided in six doses has given good results

8. Psittacosis

Psittacosis also known as Ornithosis is a respiratory infection produced by a filterable virus which is transmitted to man by certain birds especially parrots and parakeets Epidemics have occurred in families who have recently received these birds The word 'psittacosis' is derived from 'psittacus meaning parrot

The incubation period appears to be from 7 to 15 days but is said by some to be as much as 30 to 40 days The disease is characterised by a fairly acute onset, malaise and fever, at first there are no physical signs present but towards the end of first week signs of patchy migrating areas of consolidation develop at first in one lobe of the lung and then most of the other lobes are affected there is little changes in the bronchi and sputum Marked toxæmia somnolence and exhaustion are present and at the end of second or third week the temperature falls by lysis Mild ambulatory cases also occur

The virus of psittacosis is one of the largest known and c n be read ly seen under [illegible]

[illegible] ins The largest forms

The virus is unable to multiply in the absence of living cells and can be grown on chick embryo tissue in Tyrode solution or the chorio allantoic membrane of developing egg It contains two antigens one resistant to boiling and the other destroyed at this temperature. It is not resistant to glycerine and is preserved by drying at a temperature of minus 76°C. It is not killed by heating to 70°C for 15 minutes and remains infectious when its suspensions are treated with 0.2 percent formaldehyde at room temperature. Besides parrots the virus has been transmitted to sparrows canaries finches, pigeons, mice, guinea pigs and monkeys Healthy birds are also said to carry the disease. Man is very susceptible through inhalation of infective droplets or dust mixed with droppings. Infection from man to man takes place and human cases have relatively a low infectivity This is probably due to the fact that in birds the spleen and liver are chiefly affected and the virus is abundently present in droppings In man the lungs are affected and the virus is present in the sputum which in this disease is very scanty Nurses in contact with cases have however been infected

There is evidence that a low grade infection is universally present in parrots the infection being originally contracted in their nests Under condition of captivity and over crowding infection spreads from bird to bird the domestic pigeon *Columbia li a var domestica* is infected, and is a source of infection to man. In human being infection occurs either by droplets or inhalation of infected particles from desicated dropings or from coughing of patients Infection can also be conveyed through bite wounds of diseased birds and for this reason the incidence is greater in those engaged in bird trade The case fatality has been worked out between 18 to 20 per cent in reported cases

The changes revealed are those occurring in septicæmia with inflammatory condition of lungs but the consolidation is not of the type occurring in the classical lobar pneumonia. Different stages of congestion œdema and hepatization can however be seen in the vesicles which are filled with exudate composed of epithelial cells and monocytes The mucosa of

the pharynx, larynx and trachea is usually red in colour, microscopically there is infiltration of the pulp with large lymphoid cells and polymorphonuclear leucocytes The liver shows swelling congestion and parenchymatous degeneration microscopically small foci of necrosis are observed the kidneys also show swelling and parenchymatous degeneration Changes may also occur in the adrenals myocardium muscles and central nervous system

Symptoms

The onset is usually acute there being vague symptoms of malaise fever pains in the limbs abdominal distension nausea vomiting and anorexia backache epistaxis and sweating occur The tongue may be dry and white with the edges red and sore With the rise of tempera
of a throbbing
ly any of the
the headache
and it may even be rusty in character

Fever

The fever usually rises to 103°F and maintains itself with slight morning remissions. It falls by lysis after the second or third week but rarely it may come down by crisis In the lungs crepitations may be heard at the base with resonance impaired on percussion about the end of first week of the disease and rales may be heard at the apices bronchial breathing may be heard near the angle of scapula. The severity of the disease is associated with the degree of involvement of the lungs and this is an important factor in the production of toxæmia The distribution of foci in the lungs varies a good deal and appears to resemble a wandering type of pneumonia The foci may fuse and the whole lung may

Respiration

The onsiderably in this Cyanosis usually (not much more th wever the pulse is rapid and feeble During convalescence the pulse sometime suddenly rises and becomes irregular

Insomnia of varying degrees irritability and restlessness are usually present in the first week and are followed in the second week by a typhoid state of toxaemia which is out of proportion to physical signs which are present The patient becomes apathetic and stuperose the speech is sluggish and he takes sometime before replying to questions Involuntary movements of muscles exhaustion tremors delirium are present and the patient becomes semi comatose and collapsed Picking at bed-clothes and incontinence of urine and faeces may be present Facial neuralgia and even paralysis have been recorded and disturbances of vision and hearing are not uncommon

Although capable of replying questions the patient is unable to perform voluntary movements Delerium is present in all cases except the very mild ones usually at night when the fever is high Restlessness and excitement may be marked and the patient may try and leave his bed. The spinal fluid shows no changes.

Gastro intestinal Symptoms

Gastro-intestinal symptoms consist of nausea and vomiting in the early part of disease and constipation and anorexia are always present abdominal distension is a predominent feature Diarrhœa sometimes occurs and pea soup-like stools are passed The liver and spleen are both enlarged Skin eruptions resembling rose spots often occur from 7th to 13th day of disease and sometime come out in successive crops the older lesions being darker than the new ones The spots are 2 to 4 mm in diameter and fade on pressure

Leucopenia is present in most of the cases and there is no leucocytosis even at the beginning of the infection Sedimentation rate is accelerated at the beginning Thrombosis of the femoral vein has been observed during convalescence in a few cases Albuminuria may occur and inflammation of the parotid gland has been recorded in the second week.

Mild and transitory cases lasting 2 to 5 days are met with and are probably quite common Antibodies have been detected in persons who come in contact with pigeons and parrots which shows that they probably have had a mild type of disease

Mortality in some epidemics is as high as 20 per cent in severe cases *death occurring* between 10th and 15th day from thrombus or embolus secondary bacterial infection or extension of lung condition The course is usually benign in the young under 30 years Patients of mild and ambulatory type may become very seriously ill and die Cyanosis and a high respiratory rate are bad signs If pulse remains below 100 per minute prognosis *is usually good* Coma always indicates a bad prognosis

Convalescence may be slow and tedious and in all severe cases great care must be taken during the first week if the temperature is subnormal and lung signs are persisting

Post infection myocarditis *produces tachycardia and palpitation* *Thrombosis of femoral* vein may occur and if pulmonary vein is involved death occurs

Apart from history and contact with birds no definite indications can be obtained from signs and symptoms The virus can be demonstrated in the blood in the first few days of illness by drawing a few *ccm of blood from a vein in 2 per cent sodium citrate saline* and injecting 1 0 ccm intraperitoneally in two or more mice It is present in the sputum throughout the illness it is mixed with nutrient broth saline or distilled water and after centrifugalisation and filtration (to get rid of bacter
into mice The virus at times can be demonstrated
of tissues Complement fixation test can be perform
as specific antibodies are present in patients blood
has to be made from enteric fever and influenza

Treatment is mainly symptomatic and careful nursing is essential on the same lines as in enteric fever The patient should receive proper nourishment and large quantities of fluid (at least 3 000 to 4 000 ccm per day) should be given in adults Tepid sponge baths are given to reduce temperature and ice bag on the head is useful to relieve headache codeine is very effective for this purpose Constipation should be relieved by enemata or liquid paraffin internally If delerium is present special care is needed to prevent the patient from getting out of bed Expectorant drugs are not indicated, if cyanosis is present give oxygen digitalis has been tried but its efficacy is doubtful

Serum of convalescent patients and of normal persons in doses of 50 to 200 ccm administered intramuscularly or intravenously is said to be of value Anti serum has been prepared but is still under trial Sulphonamide drugs are of little value but *trypaflavine has been found by some to be very effective*

Avoiding contact with birds is an important prophylactic measure Patients suffering from the disease should be isolated in well ventilated rooms with free circulation of air Nurses should wear rubber gloves and masks preferably of the cellophane type There is danger of creating carriers by producing active immunisation with living virus it is therefore not recommended

Penicillin is effective the treatment being started with 100 000 units intra muscularly every 3 hours If no improvement in *24 to 48* hours give *double* the dose and continue treatment for 5 days after the temperature is normal If relapse occurs repeat treatment

Chloromycetin and aureomycin have both given promising results Aureo
1 mycin is given in 1 0 gm doses every 6 hours by mouth The treatment continued for 5 days after defervescene

9 Infective Parotitis (Mumps)

Mump is an infectious disease characterised by a non suppurative enlarge ment of the parotid glands and less commonly of other salivary glands It is sometimes complicated by metastatic inflammation of the testicles and less often ... both eyes

The causative agent is a filterable virus Saliva taken from patients in the early stages of the disease when inoculated into Stenson's duct in monkeys gives rise to a disease similar to mumps in these animals The disease can be carried in series in monkeys by inoculations of minced parotid gland or of filtrates of extracts of parotid glands It has also been transferred back to human volunteers after it had been maintained for several generations in monkeys

The virus disappears from the saliva between the 6th and 9th day of the disease it is present in the blood in severe cases Blood serum from a recovered animal when mixed with tissue containing the virus neutralises the action of the latter The virus survives in 50 per cent glycerol for at least five weeks

The disease is rare in infants but it may attack the new born when the mother has got the disease It commonly occurs between 5 to 10 and 5 to 20 years of age after 40 years its occurance is rare Outbreaks have occurred in school girls The disease has a world wide distribution and frequently occurs in the winter and spring

Little is known with regard to its pathology as it is not a fatal disease In the acute stage there is predominance of interstitial and peritubular lesions consisting of small celled infiltration in the gland the parenchymatous changes are inconstant and not pronounced Blood shows some increase of mononuclear leucocytes

T [illegible]
are n [illegible]
gland [illegible]
The s [illegible]
not being involved.

The swelling in the parotid glands may occur simultaneously in both or one after the other exceptionally only one gland is affected Pain and tenderness varies a good deal but generally there is difficulty in moving the jaw Submaxillary mumps may occur but exclusive involvement of sublingual gland is rare *Sym*

There may be no fever or it may go up to 103°F in a severe attack usually the temperature does not exceed 99°F The swelling lasts from 2 to 4 days and then usually complete resolution takes place, suppuration of the affected gland is very rare but has been recorded Abortive form with only slight swelling of the parotid or maxillary gland frequently occur

There is dryness of the mouth on account of impairment of the function of the glands and diminution of the secretion of the saliva the calcium and chloride content of the saliva is increased until 14th or 15th day and become normal by the 30th day

Mumps in India is usually a very mild disease

Inflamma on f the [illegible] ale and *Com*
[illegible] tion of
[illegible] violent

Encephalitis is becoming more common, optic neuritis ophthalmoplegia ot tis myocarditis may rarely occur and the thyroid and thymus may be involved.

Tenderness just behind the angle of jaw under the mandible (Hatchcocks sign) is usually present This along with the swelling of both parotids is typical of mumps

Prognosis—It is usually very good and fatalities are very rare

Treatment—The patient should remain confined to bed as this is believed to lessen the liability to complications, especially orchitis Locally fomentations with glycerine of belladonna generally give relief in painful cases If trismus is present straw or glass tube may be used for feeding Orchitis is treated in the usual way Local puncture or incision of tunica vaginalis is recommended in severe cases *Treat*

It has been recently sho [illegible] ntion *Diet*
and treatment of [illegible] mgm
daily by mouth [illegible] daily
till the orchitis s [illegible]

10. Yellow fever

Yellow fever is an acute non contagious fever which in man is a self limite infection of variable severity It is characterised by a single febrile paroxys starting 3 to 6 days after infection, toxæmia, albuminuria, jaundice and a tendenc to hæmorrhage It is essentially a disease of the tropics especially the west coa of Africa and tropical America Since it was discovered in 1900 that this disea is transmitted from man to man by the domestic mosquito, *Aedes aegypti*, ant mosquito compaigns seem to have eradicated yellow fever from most of th endemic centres in America The virus is highly antigenic in man and it attacks are followed by a lasting immunity in the surviver

In 1925 the Rockefeller Foundation sent a Commission to West Africa to investigat whether the disease there was the same as in America They transmitted the disease fror man to monkeys and found that other mosquitoes besides *A ægypti* may transmit th disease It is basically a jungle epizootic involving various vertebrate hosts and a numbe of mosquitoe vectors Animal protection tests have been developed for testing immunit to yellow fever and are used to determine the previous exposure of man to yellow feve virus It has been shown that areas subject to yellow fever are greater in Africa an South America than recognised Yellow fever in silent areas is not often recognized Th virus of yellow fever has been modified and a safe and efficacious vaccine has be developed millions of people were vaccinated during World War II

Three varieties of the disease are recognised —

yellow (1) The classical yellow fever which is strictly confined to towns and cities and ... ingle yellow fever whic ... and which is generall ... incidental to an epizoot ... margin of forests e g ... certain thinly populate rural areas of Brazil suggesting man vector man mechanism of transmission

The classical epidemic yellow fever is a disease of towns and cities and a period o ... between the entry of a case of yellow fever and the appear ... mainly a disease of jungl ... us capricornis and Aede ... ch grows in grassy pool ... sponsible for man to man ... s of rural yellow fever ... disappears within 6 or 7 ...

recognised forms of the disease often occur in ...

In South America endemic centres at present exist in the Amazon river basin Brazil Columbia and Venezuela In Africa the principal areas affected extend from the Anglo Egyptian Sudan in the east to the west coast of Africa south of the Sahara desert The valley of the Congo is also a prominent endemic area The disease is happily absent from Asia Yellow fever is the first human disease shown to be produced by a virus

les Noguchi (1919) described a leptospira known as *L icteroides* as the causative organism of yellow fever By the dark ground illumination method a considerable number of these organisms was found in the blood liver and kidneys of guinea pigs inoculated with blood from certain yellow fever cases further a pure culture of the organisms was obtained ... transmitted them through series of guinea pigs ... including those of Noguchi himself failed to ... failed to find any *leptospira* in a number of ... alestine found that *Aedes aegypti* which is the carrier of yellow fever ... as a carrier of leptospira. Subsequently Stokes ...

Maca us s n cus and *Macacus rl es s* could be eas ly infected w th yellow fever w th the production of symp oms and patholog cal les ons identical w th human yellow fever and they pro ed that the agent of yellow fever is ultramicroscop c and passes through Berkefeld filters Convalescent sera from se ere cases of yellow fever in doses of 0 1 ccm protected monkeys from further nfection w th the v rus Later Sellards and H ndle (1928)

the vorld ha e been shown to be immuno- a ns when inoculated nto rhesus monkeys fe er lesions which is rap dly fatal The f a s ngle infected mosqu to may infect a monkey Th v rus solated from man s pantrop c and possesses both neu otrop c and v scerotrop c properties

The ler (1930) showed that when wh te m ce are noculated w th the virus *i a* the intracerebral route they develop a fatal meningo encephal tis After a nun ber of such passages through m ce the v rus loses ts hepatonecrotic properties and becomes a fixed neurotrop c v rus wh h is capab e of p natural virus It fails to produce v scer fa al ei cephal t s n monkeys and k ls for mouse p otection test The mod fied deal of ts neurotrop sm and v scerotrop sm it produces encephal t s in monkeys occas onally after n racerebral noculat on and in n ce only after double the period of the neurotrop c v rus Inoculat on of th s neurotrop c virus n o rhesus monkeys may sometimes cause t to revert back to ts or ginal v scerotrop c nature

By filtrat on through graded r embranes the s ze of the v rus s known to be between 17 and 28 mill m crons It is destroyed at temperature of 60 to 65 C, and s nact vated by methylene blue (1 n 100 000) and profla ne (1 in 50,000) The v rus can be preserved for seve al years if t s thoroughly dr ed n acuum and stored at low temperatures It dies rap dly f kept in serum or t ssues at room temperature Size of

Yellow fever v rus grows n tl e prese ce of l ving cells and ts growtl is ntracellular Cells in tissue culture once infected perm t the mult pl cation of v rus even in the presence of mmune serum in the ned um

The v rus c rculates the per pheral blood n suffic ent quant t es to infect the mosqu oes o ly n the f rst three days of the illness rarely as late as tl e fifth d y at vh ch t me spec fic an bod es are usually demonstrated n the blood An attack of yellow Index enden

protection test A sim lar "monkey protect on test can be performed using the pantrop c virus

The work of the Am is trai sm tted by the b a yellow fever pa ent and after a per od w 26 C and 18 d ys at then remains infect capac ty to nfect n about t ree n onths sl ow ng that the v rus does not pass fron one generat on to another The reason is that t cannot pass through the egg stage of the mosq to Trans n

Though *Aedes aeg pt* is tl e ch ef transm tter of the disease other spec es are also capable of acti g as the vectors. Thus in South America *A leu cocelaenus* and *Hæmagogus* s been proved to *i afr ca us* is the es of *Aedes* have

Spread of yellow fever to India—The possible extension of yellow fever to ne

the development of infectivity in the insect ve
many places in India specially in the principal ports The introduction of the virus int
any c
of th
being
infec
by air, has changed the situation It is now quite easy *for an aeroplane to travel from*
West Africa or East Af
infected mosquito he m.
Hindle has found that
is no obvious reason why
if the virus was introdu
modern rapid method of
the prevention of introc
against the conveyance of the mosquitoes from the endemic areas by aeroplanes motor cars *trains etc* *Medical inspection* of all passengers and crews for the detection of all possibly infected persons should be undertaken Protective inoculation of all intending pilots and *passengers in aeroplanes is a satisfactory method*

are characteristic of the body after

contain black blood

The basic les
liver is of norma
in the middle of
Liver sections sh
flammation or pr
necrosis of the parench

Regeneration of liver cells occurs very early in convalescence and may be quite advanced in patients dying of complications during convalescence Studies on rhesus monkey infected with yellow fever showed no changes in blood serum during first stage, but shortly before death changes occur as in extensive destruction of liver tissues There is loss of ability to deaminize amino acid and to

often seen

During the course of the disease, certain distinguishing pathological features appear in the urine and blood and these are often of great value in diagnosis The secretion *of urine diminishes very rapidly and the patient* may only pass two or three ounces of an intensely yellow coloured urine The secretion of chlorides is greatly diminished The urine *contains* albumin and casts and these increase in quantity and number as the disease progresses In severe cases small quantities of peptones may also appear in the urine and in moribund cases these may be considerable in amount The blood sugar remains persistently very low and there may be an increase of guanidine like substances in the blood

The incubation period usually varies between three and six days *Classical yellow* fever is usually a severe self limited infection with severe intoxication albuminuria
the stomach and intestines (black vomit) There
days rarely four days followed by an intoxication
nd urban *types of the disease there are many mild*
may vary from a slight and hardly noticeable attack
rostration. Influenza like infection with coryza may
occur
or 3 days but with albuminuria and bradycardia
Severe cases occur with high fever, backache, etc, and with signs of intoxication jaundice and haemorrhage

Clinical sympt

Clinically the attack of classical yellow fever is divisible into three phases During the first phase of invasion there is a paroxysm of fever which seldom lasts more than 3 or 8 days, during which the temperature rises to 100-104°F The infection is often explosive, the pulse and temperature reaching highest on the very first day and after this there is tendency to decline The patient presents all the signs and symptoms of an ordinary acute infection There is congestion of the conjunctivae and mucous membranes, headache and backache are present Pain in the loins is very common and may be very distressing to the patient Severe prostration is present and is out of all proportion to the temperature, nausea, bilious vomiting and nose bleeding frequently occur. Generally after second or third day the congestion declines and the temperature reaches normal or subnormal, the patient feels comfortable, the infection period ends and convalescence begins In severe cases this period may last a few hours or a day and intoxication phase begins

The second stage of the disease is one of great intoxication and sets in about the end of the third day or the fourth day The entire clinical picture alters from one of active infection to one of severe toxæmia There is epigastric pain, an extreme fall in blood pressure, the pulse becomes slow and the bradycardia may be extreme Vomiting may become severe and persistent, and the vomitus may contain black blood and this may also be passed in the stools The urinary secretion becomes very scanty and the urine may be [illegible]

There is rapid disappearance of virus from the body about the end of the third day and as early as 4th day antibody can be demonstrated in the blood. In spite of this, symptoms of second stage occur which may end in death

In mild and moderate cases this stage of intoxication is followed by a rapid recovery and convalescence is established In the severe cases, however, a third stage of the disease sets in This is the reaction stage, the temperature rises again and an atypical remitting type of fever for many days or weeks and complications such as abscesses parotitis, buboes or secondary hepatitis may occur The jaundice may get much deeper, black vomiting may again start and the patient may get profuse diarrhœa and collapse Nervous symptoms such as restlessness, stupor and coma may supervene the urine may be completely suppressed and death may occur On the other hand this secondary fever may terminate by crisis with profuse perspiration

Relapses

Relapses occur only rarely but when they do they carry a heavy mortality Due to excessive liver damage, the resistance to infection may be greatly reduced and abscesses or even gangrene may occur in the skin and are specially liable to occur in the kidneys. Patients may develop pneumonia.

Hæmorrhages almost invariably occur in the acute disease in some degree but during the toxæmic stage serious hæmorrhages may occur specially into the stomach and intestines Hæmorrhage may be severe enough to cause death

Suppression of urine is a grave complication, and may occur in apparently milder cases with little liver damage

Diagnosis

Though diagnosis in epidemics is easy sporadic cases may be extremely difficult to diagnose Points of importance are —(1) Clean tongue with red margins throughout the [illegible] (2) Jaundice [illegible]) Albuminuria [illegible] ling from nose [illegible] typical of the [illegible]

One of the most important prophylactic measures in the control of yellow fever is the elimination of the carrier mosquitoes *Aedes aegypti* and *preventing possibly* infective mosquitoes reaching non endemic centres by aeroplane or other rapid modes of travel Following strict anti mosquito measures yellow fever has now been eradicated from Havana Vera Cruz and Panama, which were once highly endemic foci of the disease Measures against the vector mosquito should particularly be directed against the larval and pupal forms as this is by far the cheapest and most feasible method of eradicating the mosquito As the mosquito breeds almost entirely in artificial water containers and collections, ordinary anti larval measures achieve great success Destruction of adult mosquitoes by means of insecticidal sprays, fumigation, etc, may also be combined with the above

Dissemination of infective mosquitoes by aeroplane in the modern age of air *travel* is a serious menance and detailed and strict precautions are taken in aeroplanes returning from endemic areas These planes must be thoroughly sprayed with reliable insecticides before they are opened and the passengers or cargo unloaded In ships visiting endemic areas, similar strict anti mosquito measures must be insisted upon

All travellers to endemic areas should be vaccinated and any unvaccinated persons coming from such areas must be kept under observation for 6 days

By far the most effective personal prophylactic measure is the vaccination of all non immune persons residing in or going to endemic areas' All laboratory workers handling the yellow fever virus must be similarly protected The vaccine generally used is prepared from a modified strain of yellow fever virus known as 17 D which has not only lost of its viscertropic properties, but also unlike the earlier used strains, the greater part of its neurotropic activity The strain grows readily on chick embryo which is itself used for preparing the vaccine The vaccine deteriorates rapidly in solution and any remaining one hour after opening the ampoule should not be used

The virus is inoculated into 7 9 day old chick embryos through a small hole over the air sac of the egg and incubated for 4 days After this period the infected embryos are pooled, ground up and centrifuged The supernatant fluid is the vaccine and is dried in vacuum from the frozen state

One single injection of the vaccine of 0 5 ccm of a 1 in 10 dilution of the concentrated vaccine is given subcutaneously, it affords protection almost immediately against infection through exposure to mosquito bites although formed antibodies may not be demonstratable in the inoculated person s serum for a few days A lasting and effective immunity is produced by giving living virus under the skin of persons vaccinated The vaccine has not yet been in use long enough to assess accurately the duration of this immunity

The vaccine made from virus does not give rise to any marked reactions There may be only slight headache and malaise for some hours 5 to 8 days after inoculation Delayed post vaccination jaundice and mild encephalitis may rarely *occur in vaccinated persons* Slight febrile reaction may occur from 5th to 7th day of injection

11. Dengue

Dengue is also known as Dandy fever, Breakbone fever, Seven day fever, Boquet fever It is characterised by a sudden onset a dibasic febrile course lasting for 3 to 8 days, headache, severe pains in the muscles, bones, and joints,

typical rash prostration bradycardia and leucopoenia There is a sudden rise of temperature which falls on the 3rd or 4th day, there is a secondary rise and a critical fall on 5th to 7th day The disease is produced by a filterable virus transmitted from man to man by mosquitoes

is especially prevalent *Epidemiology*
e China sea Australia
nd Egypt It is also
West Indian Islands

Conclusive evidence is now available that the disease is caused by an ultramicroscopic filterable virus Ashburn and Craig (1907) infected a volunteer with the filtered blood from a case of dengue Other observers noted the infectivity of the serum of dengue patients That the cause of the disease was a leptospira was suggested by Couvy (1922) and Carbonovoa (1924) who reported the presence of spirochaetes in the blood and other fluids of the body but the claim was not substantiated Sellards and Siler (1928) found numerous rickettsia bodies both in the lumen and epithelial cells of the hind gut of the infected *Aedes aegypti* In the hands of most investigators the infective blood failed to produce the disease in animals The virus is introduced into the human body by the bite of the infected mosquito Siler et al (1926) passed the virus from man to mosquito and back to man through six generations without attenuation or increase in the virulence of the virus

Manoussakis succeeded in transmitting the virus from volunteer to volunteer almost indefinitely without any decrease in the virulence The virus can be dried and frozen without loss of virulence The disease can be transmitted from man to various species of monkeys such as *Macacus mulatta, M philipensis* and *M funictus* but not from monkey to monkey Recently Pandit and Shortt in India have succeeded in cultivating the virus on chick chorio allantoic membrane

Transmission

till the third day of the disease

The disease tends to appear in great explosive epidemics like influenza and in 1927 28 large epidemics occurred in Greece and Egypt which are said to have involved more than a million and a half people Almost all non immune persons entering an endemic area fall victims to the disease It is a disease of great economic importance on account of the debility it produces *Epidemics*

Dengue has extremely low mortality and deaths generally occur in very young or in very old debilitated persons. Pathology of this disease is therefore not known There is leukopenia the leukocytes being reduced to half the number or less per ccm leukopenia is progressive in character and is most marked on the 5th or 6th day There is marked reduction of polymorphonuclear rarely there is increase of eosinophils Some cases show no leucopenia *Mortality*

Immunity—Immunity in dengue is variable Manson Bahr is of the opinion that
though experimental infections in human *Immunity*
solid immunity for as long as a year or
ncommon in an epidemic to find a patient

The incubation period in the experimental human infections by Manoussakis was always between 5 to 7 days. In natural infections the incubation is usually from 5 to 9 days but may range from 4 to 15 days

A few hours before the onset, there are often prodromal symptoms of malaise ar

ymptoms severe twinges of pain in a finger or toe or one of the limb joints The onset is sudd with fever rising rapidly to 102° to 105°F intense headache, *anorexia and pain behind t*l eyes There is very severe rheumatic like pain in the back and the joints which is aggra at by movement In mild cases the temperature may not go above 100°F The face ma show a blotchy congestion and there is soreness of the mouth and throat. The sympton increase in severity and the patien

Sleep is difficult and patient may
which the temperature may rapic
greatly relieved the pains go the
and start getting about. This stage of remission however only lasts for from 12 hour to 3 days and the fever then returns again. The typical 'saddle back temperature curv is thus obtained This time however the temperature does not rise very high an constitutional symptoms are much less in intensity The characteristic dengue rash nov appears it is a rubeolar macular petechial measles like eruption appearing at first on th dorsal surfaces of the hands and feet and extending up the limbs It may later sprea to the trunk and face. This second bout of fever usually lasts only a day and the feve generally subsides with the appearance of the rash Sometimes the temperature rema n elevated for several days and then falls by crisis or there may be only fever for a day o two with no remission Sometime symptoms are so slight tl at patient feels only a l ttl out of sorts and carries on with his work.

Skin eruption is important from point of view of d agnosis *Primary eruption occur*

ions in all ca ... may be missed. ... neck chest ba ... uption appears ... e the temperature falls it may even appear during convalesecence and may also be evanescent It appears mostly on the trunk, but may cover the whole of the body or may be most marked on neck wrists palms thighs and ankles Itching often preceeds or accompanies the eruption and may persist during desquamation. In severe cases it may last two days

A characteristic clinical feature of dengue is said to be the slow pulse rate but this has been denied by some clinicians In the early stage of the fever the pulse may be somewhat accelerated but it soon becomes slow and may fall as low as 50 or so during the remiss on period and during convalescence The slow pulse with high temperature is known as *Faget s sign*

Epistaxis may occur at the onset and Craig has observed hæmorrhages from the stomach intestines mucous membranes menstrual haemorrhages may occur Leucopaenia largely affecting the polymorphonuclears is another characteristio feature and the white cell count, which is generally found to be about 4 000 at the onset may fall to as low as 2 000 or under as the disease progresses

Nausea vomiting and anorexia occur at the onset and may persist constipation is common but diarrhoea may be present. There may be abdominal pain and tendernes on pressure Tongue is moist and coated in the beginning it may become darker in tl e middle as disease advances by third day edges and tips become clear The kidneys are not involved

Certain unpleasant nervous symptoms are present mental depression is common throughout the fever and may even be present during convalescence which may become prolonged The cerebrospinal fluid is clear with no *cellular increase but there is increase* of sugar and albumin Pain may not be a prominent symptom in mild cases generally there is severe headache aching and tenderness of muscles of the back, arms and legs. Insomnia is a common symptom and delerium may occur especially in children

Complications rarely occur but sometime bronchitis may be present and pneumonia may rarely produce death

The combination of a rash occurring at tl e end of the disease, a slow pulse and leucopenia accompanied by relative increase in mononuclear cells and a shift to the left in the *Schilling* count are *characteristic of the disease* The clinical picture con bined with the typical saddle back temperature chart makes the diagnosis easy

Differential diagnosis is most important especially in regions where yellow fever is present the first few cases of yellow fever particularly may be confused with dengue especially in children and *if disease is of a mild type The early* appearance of albumin

and casts in urine jaundice haematemesis in yellow fever are helpful signs Phlebotomus fever is likely to be confused with dengue especially if the latter is of a mild type (2 to 3 days fever) The ordinary cases can be distinguished by saddle back temperature curve, leukopenia and shift to the left in Schilling count. Influenza in tropics is especially likely to be confused with dengue Malaria, measles scarlet fever and syphilis in the secondary eruptive stage should be differentiated from clinical history clinical symptoms and results of various laboratory examinations

Dengue is not a fatal disease in the adult but deaths may occur in the very young and very old debilitated individuals Death rate even with complications is low

Treatment Treatment is mainly aimed at relieving symptoms Dengue runs a definite course and all energetic measures to cut the disease short are useless In the beginning of the illness a saline diaphoretic mixture may be prescribed Antipyretic drugs such as phenacetin, aspirin etc may be given for the relief of headache and backache, the high temperature 104°C (40°C) should be brought down by hydrotherapy such as cold sponging etc Adrenaline has been recommended in dengue with the idea that it overcomes the asthenic stage and hastens the period of convalescence

In tropical climates the disease is mostly endemic because of the persistence of the stegomyia mosquito throughout the year though it may be quiescent for a time and then flare up again For an epidemic to spread in a certain locality the factors concerned are (1) the existence of infection in human beings or mosquitoes in sufficient numbers and (2) the existence of susceptible persons and suitable conditions of temperature and humidity As the mosquito may remain infective permanently, there is a great danger to new-comers to an epidemic locality of being infected thereby allowing the disease to spread rapidly An infected person can also transmit the disease to distant places provided there are sufficient mosquitoes to act as reservoirs of infection

Prophylax These mosquitoes are essentially domestic and they breed in flower pots tin cans artificial and natural collections of water in the immediate neighbourhood of human dwellings Hence if prophylactic measurs are to be successful, steps should be taken against their breeding and destruction and prevention of mosquito bites As the virus of dengue is present in the blood of patients for about three to four days the patient should be protected from mosquito bites by proper screening during the period, the use of various repellants such as anti mosquitoe creams, citronella or eucalyptus oil may help

Immunity It has been found that following an attack of dengue an immunity is established which may last for two to several years but it has been known to be as short as 53 days (Siler 1926) Unlike yellow fever an attack of dengue does not give rise to protective properties in the serum nor is it possible to obtain a vaccine of the virus for treatmet Hence vaccine therapy has not been successful in protecting against infection with dengue

12. Phlebotomus Fever (Sandfly fever)

The disease is caused by a filterable virus and is also known as summer fever, pappataci fever and three-day fever Clinically it is one of the dengue like fevers, and is characterised by sudden onset, fever, pain in the eyeballs, muscular pains headache slow pulse, gastro intestinal and nervous symptoms

Epidemiolo The disease occurs wherever the vector sandflies are found, and is widespread all over India, the Caucasus Egypt Palestine Syria, Iraq and the Mediterranean countries The disease is also widespread in China, East Africa and south America. In the Himalayas in India the disease is common at altitudes up to 4,000 feet.

virus The causative virus appears to be present in the patients blood only during the first two days of the disease and probably only during the first 24 hours Blood taken from a patient at the end of the second day does not reproduce the disease on injection into volunteers The virus has been successfully cultivated on the chorio allantoic membrane of embryo of chicks by Pundit Rao and Shortt (1938) They demonstrated that the serum of convalescent cases neutralizes the lesion producing agent in the culture By infiltration through graduated membranes they determined the size of the virus to be about 160 millimicron in diameter It passes through Berkefeld and Pasteur Chamberland filters and is retained by Puckall filter which lets the dengue virus through

n *Transmission*—The vector of sandfly fever is the sandfly Plebotomus pappataci a small midge measuring 3 mm in length *P minutus* is said to be vector in Aden and *P perniciosus* is also said to be a vector The female alone bites and between sundown and dawn Temperatures below 21°C (70°F) is fatal to sandflies, they breed where the mean daily temperature is between 65° and 90°F The virus multiplies in the sandfly which becomes infective in from 6 to 8 days after ingestion of the infected blood The exact period of infectivity of sandfly has not been confirmed but some believe that it remains infective for the rest of its life the virus is believed to be transmitted transovarically to the succeeding generations of sandflies Thus it is possible that the sandflies themselves act as reservoirs of the disease

Seasonal incidence—Sandfly fever is characteristically a seasonal disease which occurs in epidemics in tropical and subtropical regions as temperature below 70°F (21°C) is fatal to sandflies It is confined to damp and low lying localities Cases first begin to appear in late spring and epidemics appear during the summer months In endemic areas epidemics are particularly liable to break out amongst the new arrivals in the area and up to 70 per cent of such persons may be involved

Sandfly fever is not a fatal disease its pathology is therefore unknown Blood changes have however, been worked out and closely resemble those in dengue There is leukopenia of between 2 500 to 4 000 per cmm with relative increase in the mononuclear and decrease in polymorphonuclear leukocytes Urine is decreased in quantity and slight traces of albumin may be present Virus is not present in urine.

The incubation period is usually between 2 to 6 days but may in rare cases be
ptoms prolonged up to 9 days After vague prodromal symptoms such as malaise constipation and vertigo the disease starts suddenly with fever rising rapidly to 102° 104°F the maximum temperature is reached in 24 to 36 hours Afebrile attacks have been reported The face is flushed the conjunctivae are red eyeballs tender on pressure A severe headache soon develops and there is pain in the eyeballs photophobia and pain on ocular movement The neck and back may feel very stiff and muscle and joint pains as in dengue fever commonly occur The patient may feel sick and vomiting is not uncommon Nose bleeding commonly occurs and the throat may be sore The skin is dry hot and flushed an erythematous eruption may appear to be present papular eruption has been seen at the end of fever (may be dengue) Sweating and collapse may occur The fever continues for a day or two and then falls by crisis the entire febrile period being 3 to 4 days though in mild attacks it may last only 24 hours Cases with prolonged fever lasting 7 or 8 days are probably dengue

In severe cases there may be head retraction and other signs of meningeal irritation The spinal fluid is often found to be under pressure and may contain albumin and lymphocytes (11 per cent) Pearson (1941) pointed out the similarity between sandfly fever and benign lymphocytic meningitis Fleming *et al* (1947) have shown that the virus has a predilection for the meninges

The blood usually shows slight leucopenia during the febrile stage after which there may be a leucocytosis up to 15 000 or 20 000 per c mm The pulse is accelerated at first but soon shows a relative bradycardia When the temperature has returned to normal the pulse rate slows still further as in dengue fever

Complications do not generally occur In some epidemics diarrhoea may be a feature while in others it may be constipation Second attacks sometimes occur and these are milder

In general the disease runs a milder course in children than in adults Convalescence is characterised by debility which is far greater than would be expected from the severity or duration of the disease The mortality is nil

Immunity is usually established after an attack of the disease, but it is rather short and a relapse or second attack may occur in 3 to 8 weeks

Complications which rarely occur are intestinal hæmorrhage broncho pneumonia parotitis orchitis and nephritis

On clinical grounds diagnosis is difficult especially in mild cases which may go unrecognized Typical attacks are not difficult to diagnose

Differential diagnosis is not easy and the condition is often confused into dengue influenza, malaria para typhoid fever, relapsing fever and yellow fever

Laboratory methods are not helpful

Treatment Treatment is carried on in the same lines as for dengue. There is no drug having any specific action against this disease The patient should have a good saline purgative and should be confined to bed for 5 to 6 days Aspirin may be given to relieve pain in doses of 5 to 10 grains every three or four hours Massage of painful muscle sometime gives relief, cold sponging is refreshing As anorexia is present, food should not be forced on the patient to avoid irritation of stomach Plenty of fluid in form of bland iced drinks may be given Food should be semi fluid and solid food should not be given till the patient is convalescent Tincture of iodine should be applied to the bites Some tonics are indicated during convalescence and change of climate may be advised

Prophylaxis The prevention of sandfly fever rests on the measures against its carrier *Phlebotomus pappatasii* [illegible] eliminated by spraying tar [illegible] places such as cracks in [illegible] Cracks may be filled and rubbish round houses should be burnt Long boots should be worn after sunset, and electric fans, wherever possible, used to keep away the flies Insect repellent preparations such as pyrethrum creams or methyl pthalate may be applied to the exposed parts of the body An ointment containing [illegible]

[illegible] be used inside houses for destruction of the sandflies As the flies do not fly higher than 10 feet, living rooms in endemic areas should be situated on the upper story at a height of 12 feet if possible Localities and houses where fever is prevalent should be avoided There is some evidence that persons who develop local skin reactions to the bites may have special protection against the infection

13. Trachoma

Trachoma is a progressive virus disease of the conjunctiva which may later invade the cornea and often ends in partial or complete blindness The disease is a very ancient one and existed in Egypt in prehistoric times It was brought to Europe and spread by Napoleon's armies It was introduce into the U S A by emigrants

Distribution The disease is characteristically rural in distribution and being infectious it runs in families Children are frequently infected from close contact with mothers or other infected [illegible] adolescent group [illegible] of proper water [illegible] in a community [illegible]

The distribution of Trachoma is practically universal though it is encountered more frequently and more severely in hot and dry climates as opportunities for its dissemination and secondary infection are greater

The disease is caused by a virus which varies in size from 0 2 to 0 5 millimicrons in diameter It passes through porcelain collodian or diatomaceous filters with difficulty it is readily acted on by chemical and physical agents, it has not yet been grown on artificial and tissue culture mediums it can infect only epithelial cells *The epithelial cells of the* conjunctiva and cornea can be demonstrated to contain inclusion bod es which appear in the cytoplasm at the *edge of the nucleus as agglomerations of hetrogenous elements* as minute uniform coccoid and pink staining (the elementary *body*) or larger *pleomorphic* and blue staining (the initial body) infectious agent of the disease Each inclusion *body is believed to represent* a colony of the virus The inclusion body is believed to represent a colony of the virus These inclusion bodies are known as Halberstaeder Prowazek bodies which can be demonstrated in cells scraped from the surface of everted lid and distributed evenly over a slide The smear is then fixed with alcohol and stained with Wright s stain. Inclusions are found with difficulty and after long search the inclusion body is the infecting agent of trachoma Each inclusion represent a colony of the virus

The essential pathological feature of *trachoma* is infection of the epithelial cells which proliferate and later degenerate changes occur with resulting cicatrization In the follicular type there is thickening of epithelial cells and the mucous membrane of the con *junctivae congestion of capillaries and formation of new blood vessels* The tissues are infiltrated with lymphocytes and monocytes and polymorphonuclears if secondary infection occurs These cells aggregate into follicles which later undergo necrosis and ulcerate

in other infections

In the cornea there is at first hyperplasia of the epithelium and infiltration with lymphocytes and monocytes The epithelium later degenerates and the surface is denuded The lamellar spaces of the cornea are next invaded by the lymphocytes and new blood vessel formation occurs eventually resulting in pannus The cornea thus becomes opaque in varying degrees resulting in varying degrees of loss of vision

The infected conjunctivae and cornea *may ulcerate causing scarring perr anent opacities* and loss of vision There is increased flow of tears sero sero purulent discharge and some degree of pain

Mac Call in describes four ... small foll cles appear on the conjunctiva and *become more numerous* and s increased papillary hypertrophy a purulent discharge In the may be complete or partial conditions described in the second stage may again be established. In the fourth stage ... is generalized scarring and deformities of the lids may be produced

This is mostly on clinical grounds no accurate laboratory tests being *available* Inclusion bod es occur in only 50 per cent of cases and are scanty inoculation in apes is expensive ... The important points clinically are —(1) Follicular or papillary ... rnea (3) *cicatrization In early cases the* ... n of conjunctivatis (syphilitic allergic, etc) made

With early diagnosis and treatment recovery may be effected without any permanent damage Recurrences are however common Scarring of the lids may cause entropion or *turning in* of the eyelids, and trichiasis In occasional cases the lids may turn outwards (ectropion) Loss of vision caused by infiltrat on and vascularization of the cornea usually improves with treatment If however scars or opacities have occurred on the cornea the loss of vision is permanent Deformit es of the eyelids can be corrected

In the early follicular stage the eye is irrigated with boric acid saline or a *0 125 per cent silver nitrate* solution or 15 per cent silval three or four times a day for several days after which the operation of *grattage* may be performed

the silver nitrate is stopped and drops of zinc sulphate (0 2 to 0 5 per cent) are prescribed twice daily In the papillary type of the disease the operation is om tted and the rest of the treatment applied as described above If silver nitrate is painful apply copper sulphate in form of a pencil or 10 per cent in glycerine fol owed by irrigation to protect cornea from injury For use at home 0 2 per cent copper sulphate solution is given which is later replaced by zinc sulphate

Treatment pannus

There is no satisfactory treatment for pannus When ulceration is present hot fomentation and use of atropine are advisable For secondary infection optochine metaphen etc have been used and a 5 per cent sulphathiazol ointment has given good results If irritation is severe camphor drops are soothing (sodium bicarbonate gr 20 boric acid gr 10 camphor in oil dr 1 distilled water oz 1)

... the treatment of

Sulphonan

Prophylaci immuni_at

Attempts at proph ...
but without success
measure of success pa
ing the inc dence of
sanitary measures such as separate cakes of soap and towels for individuals use of clean handkerchiefs avoidance of rubbing the eyes with the fingers and exposure to dust In school children there is a real danger of rapid spread of the infection and the affected children should be segregated and taught to avoid spread ng the infection

It is suggested that trachoma should be made a notifiable disease

14 Rift Valley Fever

Occurance

Rift valley fever as disease in man occurs in connection with enzootic hepatitis an epidemic disease of sheep and cattle caused by a filterable virus probably propagated by mosquitoes The disease is occasionally transmitted to man and is confined to the Rift valley area of Kenya in East Africa and in Central Africa The incubation period is 5 to 6 days it starts with general malaise headache severe bodily pains leukopenia and saddle-back temperature The d sease was first seen in Kenya in 1912 in sheep and in 1931 infectivity of blood of d seased animals for man was demonstrated by direct inoculation experiments. A number of human beings become infected every year and all recover

The *virus occurs in the* blood of the infected animals and may also be recovered from the liver, spleen and other organs It is attached *to the red blood cells* and may pass through the placenta of pregnant animals and infect the fœtus The virus is between 23 and 35 millimicr ... may be preserved and retain its virulence in ... nths *The virus is present in the blood of* ... the attack after which it disappears proba ... *irus has been successfully* cultivated in a ... and also on the growing *chicks chorio allantoic* meml rane

In addition to sheep and goats cattle are also susceptible to the natural disease Man and monkeys and *many rodents (mice rats guinea pigs and rabbits)* are also susceptible to the virus 50 per cent of rats and ferrets die of infection In these animals transmission can be effected by subcutaneous intraperitoneal intratesticular or intracerebral inoculation or instillation into the nose or conjunctivae

In cows goats monkeys and squirrels the infection is not fatal The pantropic virus may acquire neurotropic properties through intracerebral passage The virus resembles yellow fever virus in as much as it exhibits acidophilic intranuclear inclusions in the liver and a lasting *immunity is conferred by an attack* there is however *no cross immunity between* the two

Transmission of the infection from animal to animal or to man probably occurs by inoculation through the mucous membranes or abrasions in the skin Mosquitoes of the genus *Mansonia* and *Taeniorhynchus brevipalpis* are suspected as the *vectors of the disease in* nature

In animals there is a focal necrosis of the liver In adult animals the foci may remain small and discrete but in young lambs they frequently enlarge and coalesce and may thus *involve the whole of the liver substance Microscopically the lesions are seen to consist* of infiltration with polymorphonuclear and mononuclear leucocytes and hyaline degeneration of the liver cells Intra nuclear inclusion bodies have been described by Findlay in the *livers of infected* mice and this change is known as oxychromatic degenerati n

In man *the incubation period generally varies from 4 to 6 days Prodromata may* consist of nausea and discomfort over the hepatic region The fever starts suddenly with *severe headache* pa n in the back, pain in the eyes and photophobia *Insomnia mental con fusion vertigo,* anxiety may occur The face is flushed, the tongue coated, and there is a tendency to nose bleeding Congestion of throat slight cough and an sense of fullness ... Constipation is usual and the urine may be ... does not rise above 103°F but ... th day of the disease Recovery ... ur which is not as high as the first an ... lly runs a comparatively mild course and there is practically no mortality *There is usua y some leucocytosis at first but* leucopaenia soon developes by the 3rd or 4th day leukocytes falling below 3 000 per ccm

Convalescence is short though relapses on the 10th day have occurred

In man an attack confers an immunity which lasts for 6 years or more In animals the immunity is said to last only for about 6 months

Cl nically the disease cannot be d fferentiated from dengue an l influenza Intraperitoneal inoculation of 0 1 ccm of blood *from the patient into mice produces in positive cases* encephalitis in 48 to 72 hours To distinguish this virus from other viruses, controls are put up which are inoculated with the patients blood mixed with convalescent serum After *the disease is over* mouse protection test similar to that employed for yellow fever can be employed to confirm or establish the nature of the virus The complement deviat on test is also employed and usually rema ns positive *for at least 6 months after the fever*

Prognosis is generally good Rarely throml ophlebitis occurs which may end fatally

Absolute rest in bed no food except fruit juice and alkalized water are indicated The treatment is symptomatic Convalescent serum has been reported to abort attacks *Considering the involement of the liver,* glucose should be given freely both by mouth and by the parenteral route

Successful prophylaxis is reported to have been achieved with the use of a vaccine made from 9 fixed neurotropic viruses

The flocks of sheep should be removed to an altitude of 7,000 to 8,500ft which are mosquito free Reduction of disease in animal reservoir may reduce human infection

15. Influenza (La grippe)

Influenza is an acute infectious disease characterised by fever prostration liability to pulmonary complications and to epidemic incidence It is a speciffic disease caused by a specific virus but term influenza has often been loosely applied to many febrile conditions resembling true influenza Stuart Harris Andrews and Smith (1938) proposed that the name "epidemic-influenza" should be used for the specific virus disease and the term "febrile catarrh" for the pharyngo laryngo tracheitis syndrome

The workers associated with influenza and influenza virus work at the Nat onal Inst [illegible]

historically [illegible]
widespread
was appare[illegible]
be used to include both the virus produced influenza and the symptom-complex [illegible]

[illegible] influenza from the febrile catarrhs"

Pandemics of [illegible]

Pandemics of Influenza

Till 1918 it was generally believed that the causative organism of influenza was Pfeiffer s bacillus In the 1918 influenza epidemic on the Western front in the first Great War the influenza becillus was, however found only in 2 3 per cent of the cases. This led to serious doubt being thrown on the role played by this organism in the causation of the disease.

From time to time it was suggested that influenza might be due to a filtrable virus but in the absence of an experimental animal it was not possible to prove the hypothesis

In 1933 Laidlaw and his colleagues discovered a suitable experimental animal in the fer et and it has been proved that influenza is caused by a filtrable virus During the epi lemic in 1933 filtered throat wash ngs obtained from patients at an early stage of the disease were found to be infect [illegible]

Francis in America Burnet in Australia and Pettet and others in Alaska isolated *similar* viruses from influenza cases It has also been shown that demonstration of the virus in the naso pharynx of a patient was regularly associated with a subsequent rise of the anti bodies in the patient's serum *during convalescence* as measured by the mouse protection test or the complement fixation test

irus *The influenza virus*—It was believed that all the human strains of the influenza virus were identical but the work of Magill and Francis (1936) and Burnet (1937) has shown that although there is a certain basal antigenic resemblance between all *the influenza viruses* the different strains can be divided at least into two types by means of active and passive immunity experiments in animals It appears that there is a common antigen in all the strains and on top of it there are minor antigens

Swine influenza virus from cases of swine influenza in America has been isolated and it is now known *that human influenza virus are immunologically* related possessing certain common antigenic factors The two viruses are not however immunologically identical as they can be readily differentiated by mouse protection tests with appropriate immune horse or rabbit sera

T
iptoms The
may
insom
pulse
even
and pharyngeal mucous membrane is dry and red and cough occurs in paroxysms

tinal In the gastro intestinal type the symptoms pertaining to the alimentary tract predominate and this *type is prevalent in some epidemics The onset is the same as in the simple type* but the temperature usually does not rise above 99°F or so Within 24 hours of onset nausea and vomiting pain and tenderness in abdomen set in. There may be constipation or *diarrhoea, vomiting is persistent and large quantities of fluid with mucus is brought* out. The condition may be mistaken for acute abdomen but there is no rigidity of muscles

The lungs may be affected in a large number of cases There may be dullness over the lower lobes with numerous adventitious sounds on auscultation Signs and symptoms ... nd are often blood stained Serous ... s s of 15 000 to 30 000 ... ase to 7 or 8 millions ... corpuscles and casts

Sometimes the upper respiratory passages are involved producing tonsillitis laryngitis *sinusitis* and *otitis media*. After gastric influenza symptoms of morning nausea and loss of appetite persist In such cases a fractional test meal shows excess of mucus in the resting juice hypochlorhydria or even complete absence of acid as a result of chronic gastritis. *Catarrhal colitis rarely occurs* and Jaundice occurs in terminal stages of patients with severe toxaemia

pe *Symptoms pertaining* to nervous system may be present in form of meningo encephalitis (headache photophobia, head retraction) Polyneuritis has rarely been met with also pericarditis and phlebitis are rare complications Some of the sequelae of influenza are asthenia with *mental depression low blood pressure recurrent drenching sweats and* tachycardia with a pulse rate at rest up to 100 per minute which on exertion increases to 120 per minute

This varies according to severity of the epidemics but it has been observed that the mortality is always high in those cases who do not go to bed immediately on the onset of the disease *In small epidemics mortality* rate is very small Unfavourable signs are insomnia persistent vomiting falling temperature and blood pressure rising pulse rate leucopenia and excessive leucocytosis (above 50 000 per cmm) pneumonia haemorrhagic tendency empyema and *toxic jaundice*

The sudden onset of fever malaise headache pain in limbs hyperaemia of mucous membranes of the mouth nose and *pharynx are suggestive* of influenza Definite diagnosis is however difficult till the disease has developed

The cases of *true influenza* can generally be distinguished from those of febrile catarrh by a consideration of the points shown in the following table —

Epidemic influenza	Febrile catarrh
History—The onset is sudden, without premonitory symptoms The first symptoms are constitutional, and include headache, shivering, muscle pains and dizziness Respiratory symptoms develop later with coryza, sore throat and cough	*History*—The onset is insidious, with premonitory "cold" and cough Respiratory symptoms usher the disease, and sore throat and cough dominate the picture. The cough is paroxysmal, irritating and painful The voice is hoarse Often there is much expectoration
Course of Fever—A rapid rise of temperature on the second day of illness ... but a short dry cough appears	*Course of Fever*—General symptoms come later, there is no characteristic course of the fever
General aspects—A heavy drowsy facies, drooping eyelids, glistening eyes, dusky cyanosed lips are characteristic.	*General aspects*—The patient has the appearance associated with a heavy "cold" with brightly flushed face, injected conjunctivae and slightly cyanosed lips.
Physical Signs—An obstructed nose a ...	*Physical signs*—An obstructed nose, a ... mucous or mucopurulent exudation. Usually signs in the chest are absent, but rhonchi may be heard.
Complications—Chest complications predominate and characteristically take the form of bronchitis or pneumonia.	*Complications*—Chest complications are commoner than others, and include bronchitis of the larger tubes or bronchopneumonia Hæmolytic streptococci are commonly associated with the chest complications
Variations—Cases are uniform in type (though not in severity) and there is no tendency to admixture with cases of tonsilitis, etc.	*Variations*—The clinical picture is very variable Cases as described above are often admixed with those of frank tonsilitis, etc.
Character of epidemic—The epidemic appears suddenly rises rapidly to a peak, and ends in about two weeks in a closed population.	*Character of epidemic*—The epidemic has a slow rise and fall, with a prolonged duration over several weeks
Influenza virus—The influenza virus is recoverable from the pharynx	*Influenza virus*—The influenza virus is not recoverable from the pharynx

Immunity

An attack does not confer absolute immunity, in fact in some cases susceptibility to the disease may be increased The separation of pandemics by long intervening period shows that some degree of resistence might be produced. Animal experiments showed that in ferrets only a low grade of active immunity can be produced but that mice could be immunised both passively and actively against intra nasal instillation of the virus Anti sera prepared in horses and rabbits, subcutaneous or intra peritoneal injections of living or formalised mouse virus, and intra nasal inoculation of egg passage virus have all been shown to afford protection to mice

Following the success obtained in mice, attempts have been made to produce active immunity in m... safe to be t... cutaneous in... virus have b... in the neutralising antibodies.

There have been only limited clinical trials of active immunisation in man by the above two methods The trials with living culture virus in America have shown that a considerable immunity to epidemic influenza can be produced but it is not clear whether such immunity is of short or long duration The trial of formalised virus in England in the 1936-37 epidemic did not yield conclusive evidence largely due to unavoidable premature exposure to infection of the vaccinated men But the fact that a few of the volunteers succumbed to typical influenza of proven virus aetiology more than 14 days after vaccination shows that the method used was not completely successful

It is essential for the patient to take to bed early, as there seems to be a greater liability to pneumonic involvement in those who do not take early rest The bed should be placed well away from the walls and the room should be large and well ventilated *Neglect of fresh air not only hinders recovery in the presence* of pulmonary complications but also tends to induce them Fresh air is the most important factor in the treatment of influenza

In the early stage the diet should consist of fluids only later easily digestible solids are given In gastric type of influenza the stomach is very irritable and very light diet has to be given e g barley water, weak tea fruit juice glucose broths etc Large quantities of fluid have to be given When vomiting is persistent glucose saline may be given parentrally

The patient is sponged regularly with tepid water An initial dose of calomel followed by a saline purge should be given in all cases

Symptomatic treatment—There is no specific drug for this malady Dover's powder 10 gr with aspirin 5 gr, at the onset, often relieves the early coryza Quinine salicylate in 3 gr doses thrice daily is helpful A diaphoretic mixture with sodium salicylate is given for fever and pains When the cough is troublesome local application on the chest, throat paints and sedative mixtures are often of service Inhalation of compound tincture of benzoin is very useful failing this a spray containing chloretone and menthol 2 per cent of each in liquid paraffin may be used In intractable cases relief may follow from the administration of a mixture containing syrup of chloral ½ dr, ammonium bromide 20 gr liquid extract of glycyrrhiza 20 min in repeated doses

Treatment is mainly dependent on symptoms and complications as they arise The common complications are sinusitis otitis media mastoiditis bronchitis and broncho pneumonia These should be treated on the usual lines If pneumonia is due to pneumococcus, sulphonamides and penicillin should be used (See sections on sulphonamide and antibiotics)

d be a

danger of infection as it favours ...
most potent cause in the spread of epidemic Generally speaking the best course to adopt is to pursue a regular healthy life avoiding excesses of any kind.

The prophylactic treatment with drugs is without effect Vaccines have been tried to prevent an attack especially among children In view of the fact that secondary bacterial invasions take place in the upper respiratory tract efforts have been made to mitigate the severity and cut down the number of these infections

by employing a vaccine composed of the visible pathogenic organisms This is a simple antigenic mixture consisting of heat killed cultures of *pneumococci*, *influenza bacillus* and *Streptococcus hæmolyticus* This is given at weekly intervals over a long period of time, about 8 to 10 injections being given before the winter and a similar number after it This vaccination though it has not proved effective in preventing an attack, is claimed to have the power of reducing the severity of infection in those vaccinated Other measures have from time to time been advocated such as excess of vitamin A and D in the diet and irradiation with ultra violet rays, but they do not in any way seem to diminish the chances of infections

[illegible]

Personal hy

16. Infectious Coryza (The 'Common Cold')

This is characterised by an acute catarrhal inflammation of the mucous membrane of the upper respiratory passages especially nose and throat

Etiology

The prolonged studies on the bacterial flora of the nose and throat of human beings and of monkeys have conclusively shown that although the ordinary naso-pharyngeal organisms, streptococci pneumococci influenza bacillus etc., may be of importance as secondary invaders they are in themselves incapable of initiating a cold, which is caused by infection with the specific virus.

These findings have been further confirmed by study of an isolated Arctic community in Spitzbergen which is ice-bound for from seven to nine months in the year, and has no communication with the outside world. The incidence of colds per person in Spitzbergen is about half the average for dwellers in the temperate zones These colds occur in the form of an epidemic within one to two weeks of the arrival in port of the first steamer

The initial symptoms are heaviness in the head and eyes sneezing dryness in the throat, lassitude and feeling of chilliness These persist for some hours and then local signs of inflammation become manifested, i e., discomfort in the throat, pharygitis and stuffines in the nose. The temperature may rise to 99 5° or more watery discharge from the nose starts within a few hours of the onset nd may be in form of a continuous drip this is usually associated with conjunctivitis in both eyes Shooting pain may be present above the eyes and the catarrh may extend to the frontal and maxillary sinuses or downwards into the larynx and trachea. The discharge becomes less copious and purulent in a day or two the constitutional symptoms abate, the patient becomes free from symptoms in 24 to 48 hours only a blocking sensation in the nose being left. In about a week the nose also becomes quite normal

The symptoms of cold vary with individuals thus one may have more throat symptoms in another larynx is more affected and become hoarse, in yet another the conjunctiva is more involved

Immunity conferred by an attack is short, but another attack rarely occurs in less than three months.

Complications which may occur are tonsillitis temporary deafness on account of blockage of Eustachian tube, laryngitis bronchitis pneumonia and gastritis

In the earliest stage it is possible to abort a cold by a good saline purgative and obtaining free diaphoresis The patient should be warmly wrapped up in bed and given a hot drink, with or without alcohol, quinine 5 grains every two hours for 3 or 4 doses, or 10 grains of Dover's powder The essential oils are excreted by the respiratory tract, and are much used in this connection, onions are a household remedy, cinnamon is efficacious in large doses, 1 drachm of the essence in hot milk several tir
in an atomiser Especially after
the nares with warm normal salir
discharge becoming purulent An inhalent consisting of menthol 10 gr, eucalyptus oil 20 min compound tincture of benzoin 60 min and 70 per cent alcohol to 1 oz is useful, a tea spoonful is put in half a pint of hot water and the vapour is frequently inhaled.

In view of the aetiology of the infectious cold one cannot expect any good results by immunisation of the population with vaccines prepared from cultures of the common naso phyryngeal organisms Trials with such vaccines have not given encouraging results

Prophylaxis with injections of living cold virus has been tried but there is no evidence that such a procedure appreciably reduces the number of colds contracted

17. Small-Pox (*Variola, alastrim*)

Small pox is an acute infectious disease characterised by fever and toxaemia and followed by an eruption which in about eight days passes through successive stages of papule vescicle and pustule A secondary rise of temperature occurs during the pustular stage of eruption The disease may occur in epidemic form and then there is frequently a high mortality rate

The disease is of great antiquity of widespread distribution and occurs both endemically and epidemically It is particularly prevalent in Africa and Asia and at the present time the classical disease is confined to tropical and sub-tropical countries India is now a-days on of the most important focus of the disease. In South and Central America scattered foci of the virulent disease are encountered and Mexico is a severely endemic area The disease has been practically eradicated in its severe form from most of the European

Aetiology and mode of infection —The casual agent is a virus about 0 17 u in diameter which is filtered with difficulty Sometimes the filtrate is infective sometimes not It has been found that the virus is most readily filterable in 'hormone' broth with a pH of

Etiology

thrown down on
te coccoi l bodies
in lesions, and
the actual virus
that the virus
variola has not
yet been cultivated outside the body, that from vaccinia has been found to multiply in a medium consisting of fresh minced adult hen or rabbit's kidney along with fresh serum and Tyrode's solution Thus growth in vitro can be obtained in the presence of surviving tissue cells Cultures can also be obtained readily in the chorio allantoic membrane of the developing chick and in minced chick embryo

The virus is comparatively thermolabile, its pathogenic properties being practically destroyed on exposure for an hour at 55°C though it still retains some antigenic power (Gordon) It persists practically unchanged in 50 per cent glycerol and in 10 per cent ether its resistance to the former being taken advantage of in the preparation of vaccine lymph for preventive inoculation The virus is resistant to drying and in variolous crusts clothing and fomites remains infective for long periods Strains of virus may vary considerably in virulence

out 1 4 u in diameter
They are contained
doubt that these so
idence that they are

Mode of infection —Infection takes place in nearly all instances through the respiratory tract, other modes of infection such as direct ingestion of infected material or direct contact with the infected skin are quite exceptional The usual sequence of events is that the

Mode of infection

follicles, this theory however lacks experimental proof In cases of naturally acquired disease no local lesion arises at the site of contact of the infected material with nasal or buccal mucosa and this constitutes a fundamental difference between the natural and artificially inoculated disease In the natural disease the virus apparently passes between the epithelial cells without affecting them but its site of location is unknown The constitutional symptoms in small pox are undoubtedly due to elaboration of the toxin but the presence of the virus in the blood and toxaemia are not always synchronous The regular and rapid development of local lesions in small pox suggests that multiplication of the virus occurs at those sites a toxin is at the same time possibly secreted which inhibits the activity of the phagocytes and facilitates the growth of pyogenic organisms From about the fourteenth day and onwards the pocks dry up and separate the living virus is contained in the dessicated scabs and these are able to transmit the disease to a new host

Immunity to small pox may be acquired by a previous attack of the disease by variolation or by vaccination and re vaccination The immunity conferred by an attack of smal pox usually lasts throughout life and variolation also gives a similar immunity That vaccination also protects against small pox was first demonstrated by Jenner who showed that inoculation with cow pox protects against subsequent inoculation with small pox Many investigations in this connection have been carried out and the results indicate that the material from the eruption of a small pox case produces in calves a disease identical with cow pox (vaccinia) If the virus is passed through the host of certain species, the activity of vaccinia virus is better maintained After inoculation with vaccinia virus a lasting general immunity develops. In rabbits by whatever route the vaccinia virus is introduced, the animal becomes resistant within about ten days. The virus is rapidly taken up by the

Immunity

leucocytes and remains in the circulation for at least eight days In monkeys after inoculation with vaccinia virus perfect protection is obtained against variola and alastrim but the protection afforded by variola or alastrim against vaccinia is only partial Highest *immunity is obtained if a living virus is used. Heat destroys the antigenic property of* the virus very considerably and it has been found that lymph heated to 100°C has no immunizing effect at all With raw lymph immunity develops from the fourth day and becomes maximal about the tenth day

Seat and nature of immunity—The amount of immunity present in man after vaccination and re vaccination can be estimated A practical method depends on the observation *of immediate reaction produced, the earlier and less the reaction the greater is the* immunity The seat of immunity conferred by vaccination was at one time supposed to be confined to the ectodermal epithelial cells The modern tendency is to regard immunity *as general and humoral rather than local and cellular* It has been shown that the variolo vaccine virus readily passes into the blood stream and can be found there within a few hours of the inoculation From the blood stream it passes into the reticulo endothelial system and becomes generalised throughout the body It is considered by some that the *immunity is dependent on two factors the dose and the area involved Others consider* that it depends more upon the dose than area though there is evidence to show that a minimal dose gives as strong an immunity as a potent dose. Though immunity has been shown to result from the use of killed virus on the whole there remains considerable doubt whether immunity of any practical value can be produced by the use of killed or attenuated virus

Specific variolicidal antibody was first discovered by Sternberg in 1896 This antibody has been shown to be closely related to the production of immunity After an attack of the disease these antibodies may persist for years and are increased after re vaccination

The virus is carried by the blood and becomes localized in the skin and mucous membranes The specific lesions occur in the epidermis where loculated vesicles are formed by degeneration of cells and entry of fluid exudate. Polymorphonuclear and large mononuclear leucocytes accumulate and necrosis develops secondary infection occurs and suppuration is produced healing occurs with scar formation The virus may invade the *cornea producing opacities and blindness*

In the skin elevated macules vesicles and pustules are produced in the mucous membrane ulcers are formed and any part may be effected In the hæmorrhagic form extensive hæmorrhages occur in the corium

The incubation period may vary from 10 to 17 days though in the great majority of cases it remains constant at 12 or 13 days When the infection is transmitted by inoculation the incubation period is generally shorter *being from 6 to 8 days*

The pre eruptive stage of small pox usually lasts about 2 days The onset is usually sudden with malaise high and sustained fever (102 to 104°F) severe backache, headache
stage and pains in the arms and legs The backache at *this stage is a very characteristic feature* and may be of an extremely severe nature so much so that it has occasionally been mistaken for renal colic A prodromal erythematous scarlatiniform or hæmorrhagic rash may also occur in some cases It starts on the face and rapidly spreads over the chest and flexor aspects of the arms and legs.

… at fi st on the face parti

backache and headache also disappear and the p…
however there is a secondary rise of temperature as the vesicles become pustular on account of invasion of the lesion by skin bacteria. By about the ninth day of the disease the pustules either rupture or dry up without rupturing and scabs begin to form After a couple of days the scabs begin to fall off leaving depressed pigmented scars

Four distinct clinical *varieties of the disease are recognised* discrete hæmorrhagic and confluent and alastrim or variola minor

In discrete small pox the rash is not very profuse and individual pocks are separated from each *other by intervening* areas of normal skin The constitutional symptoms are generally mild, almost disappearing on the appearance of the rash The mortality rate is low

In confluent small pox the rash is very profuse and with the development of the pustular stage the pox run together
There is ofte-
may give for
rel ef from t
mortality rat th usually occurs from overwhelming
toxaemia or It is this type of the disease which
leaves extensi

Hæmorrhagic small pox is a malignant and extremely fatal type of the disease Hæmorrhages occur from the mucous membranes and from the skin between the pocks In the very severe type which fortunately is comparatively rare the patient may be over whelmed by toxaemia and death may occur even before the rash has appeared More often however the patient survives for a few days and a few developed papules may be apparent at the time of death

Hæmorrhagic small pox

Variola minor

Complications—The common complication is laryngitis which may produce serious œdema Bronchitis broncho-pneumonia keratitis septicæmia and post infectious encephalitis (rarely) may occur

Complications

In early stages the disease may be confused with influenza or dengue The diagnosis becomes clear when eruption develops but it may be confused with chicken pox (pre eruptive stage short) measles and secondary stage of syphilis

The demonstration of elementary bodies in the vesicle fluid, is one of the laboratory methods employed This is however of no value in differentiating between small pox and chicken pox The technique employed is very similar to that for the demonstration of spirochætes by dark ground illumination

Serological methods of diagnosis include agglutination and complement fixation tests

Treatment

doses of aspirin or *pyramidan* may be prescribed to relieve headache It is always advisable to crop the hair short or have the head shaved because it helps to maintain cleanliness and gives a better opportunity to make necessary applications

The mouth and throat require almost constant attention Antiseptic gargles and demulcent drinks are to be frequently given especially when there is difficulty of swallowing In the latter case it is helpful to spray the throat with 1 per cent solution of cocaine or orthoform The eyes should be frequently bathed with some antiseptic lotion such as boric acid protargol or argyrol solution may be dropped into the eye once daily Many eyes are lost due to development of corneal ulceration but if detected early it yields to treatment An ointment of yellow oxide of mercury with atropine should be applied twice daily should keratitis threaten For sleeplessness and delirium and to allay discomfort of the secondary fever opium is the drug of choice Dover's powder in doses of 10 gr should be given twice daily, morphine may have to be given hypodermically Chloral hydrate and bromides as sedatives are also useful

In the *eruptive stage* the patient should be sponged and this is especially valuable when the temperature is high and is accompanied by severe toxaemia and delirium tepid sponging has sometimes to be replaced by cold packs In less severe cases a bath (at 98°F) may be employed and a solution of potassium permanganate added to it In the early stage of eruption cold wet applications give much relief a mask soaked in glycerine may be applied a carbolic acid compress is also useful Some advocate the painting of the face with dilute tincture of iodine once or twice a day for the first 8 or 10 days and then apply vaseline but it is better to use a 5 per cent solution of potassium permanganate twice or three times a day until scabbing begins after this it should be used less frequently Many methods have been tried with a view to aborting the eruption and preventing pitting but none are effectual Exposure of the patient to the effect of red light in order to prevent suppurative changes in the pocks has been recommended but this is ineffective To mitigate the offensive odour emanating from the skin lesions dilute carbolic acid lotions may be used starch poultices and alkaline washes are used for the removal of crusts

In the initial stages of eruption there is widespread diffusion of serum into these lesions and this may cause sudden fall of blood pressure which causes collapse At this stage death is not due
The treatment at this stage is transfusion
in standard doses are generally given anc
a secondary infection (which is the cause of secondary rise of temperature) Administration of penicillin immediately before and during pustular stage is helpful

Adequate hydration and nutrition should be maintained by transfusion of saline or *glucose solution to which 200 mgm of ascorbic acid and 20 mgm of* thiamine chloride are added For pain give codeine and aspirin For itching apply calamine lotion with 1 0% phenol Eyes should be cleaned with saline and boric lotion frequently

[illegible] ted

Vaccination and re vaccination —Small pox is a preventable disease and the advent of vaccination has greatly reduced the incidence and mortality of the disease It is well known that the incidence of small pox is entirely amongst the unvaccinated and when the vaccinated are attacked death occurs amongst [illegible] vaccination protection Prophylactic [illegible] rvations of Jenner made in

pox virus and that it has been attenuated by passage through cattle Small pox vaccination is therefore active immunisation with an attenuated virus In its early days vaccination was practised with the virus taken from pustules produced in other human beings This practice has now been given up and now a days the material obtained from the pustules raised in the calves is generally used Calves may be inoculated from spontaneous cow pox or from vaccination pustules in children or from pustules obtained in calves after several passages of small pox virus through calves Though calf lymph is generally employed for

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are always present when it is removed from the pustules of the calf. Glycerine prevents the further growth of bacteria and gradually destroys the bacteria that are present and the lymph becomes sterile after storage for about a month. The usual procedure of vaccination is to vaccinate in a single linear incision or scratch not more than ¼ inch long through the epidermis. Other methods of vaccination are the multiple punctures or pressure method through a drop of vaccine, the drill method in which a superficial layer of the epidermis is removed, the method advocated is to make two or three parallel incisions ½ inch long and 1/16 inch

[illegible]

dirt and injury

After vaccination there is an incubation period lasting about 3 days during which little change occurs at the inoculated site. A localised papule develops on the fourth day which becomes vesicular on the seventh or eighth day and matures ... g popularly known ... venth day and the ... off normally about ... ced as vesiculation proceeds with headache, malaise, enlargement of the axillary glands and in some instances of the spleen. In infants fever may be over 100°F. In re-vaccination the degree of reaction depends on the amount of immunity remaining after the primary vaccination. The less the immunity, the closer the re-vaccination approaches to a normal primary vaccination and the higher it is, the less is the local reaction.

Stages of vaccination

Strong evidence exists as to the protection afforded by vaccination against small pox. Vaccination performed immediately prior to exposure to small pox affords almost absolute protection against the disease, if done during the incubation [illegible]

[illegible] lasts for 10 to 15 years. As the effect of vaccination appears to wear off with increasing age, it is advisable to perform re-vaccination at about 7 years and again at the age of twenty. Vaccination should always be repeated in the event of exposure or anticipated exposure to the disease or when the disease breaks out in community.

Complication of vaccination.—Of the common complication suppuration and tetanus may be men[illegible] ... occurs either thro[illegible] ... etanus is a rare ... After [illegible] ... [illegible]ing to the aff[illegible] ... been suggested that the disease is similar to that seen in encephalomyelitis following measles and in disseminated sclerosis being caused by some neurotropic virus which is stimulated into activity either by vaccination or by some exanthematous infection. Encephalitis is believed by many to be due to vaccinia virus itself.

[illegible]

extensively tried for prophylaxis The other method of getting sterile material has been to grow the virus in tissue culture and [illegible] embryo The egg membrane lymph can [illegible] diminution in potency Using this mater[illegible] the lesion produced in rabbits and man [illegible] the calf lymph Sufficient evidence has [illegible] *using egg membrane lymph for vaccinatin*[illegible]

Besides compulsory vaccination in endemic and epidemic areas other methods should be adopted so as to prevent dissemination of the infected material from the sick person to those around him It should be realised that infective material exists in the eruption and may be carried through the air and persons coming in contact with the patient may them selves be infected or carry and retain dangerous material The first step towards prophy laxis when a case occurs, is to isolate the infected person and treat him in a hospital specially meant for the purpose The infected premises and the infected clothing should be thoroughly disinfected. Downie and Dumbell (1947) have shown that virus from the vesicle will grow on the chorion allantoin of the chick after being kept in dark for 84 days or more, crusts from healing lesions kept in dark at room temperature yielded virus after 417 days The small pox patient should not be discharged from the hospital until all infected epidermis is removed

This depends on the strain of the virus which has produced the infection Mortality varies from less than 1 to 40 per cent depending on the care which the patient receives to prevent secondary bacterial infection and complications such as broncho pneumonia

18. Varicella (Chicken-pox)

Chicken-pox is an acute *infectious virus disease which is characterised* by an eruption which tends to appear in successive crops The onset is gradual and symptoms though mild are those of a general infection The disease for a long time was not differentiated from small pox

[illegible] stages and has a world wide

[illegible]

of small localised epidemics [illegible] hospitals The period during which it is contagious is not known with certainty but it is probably the first week or ten days of illness

[illegible] demonstrated in the vesicular fluid by suitable staining [illegible]f animals with material from cases of [illegible] found that from 5 days after the onset [illegible]hich agglutinate the elementary bodies [illegible] *The close relation of the viruses of* [illegible] the cross immunity, cross agglutination [illegible]wever, not to be a complete antigenic

As the disease is not *fatal its pathology is not known* The vesicles, however are very superficial in the upper and middle portion of the rete malpighii

The [illegible] period is generally 14 or 15 days, but the patient may be infective for [illegible] all absent

[illegible]

infrequently involved. The rash often continues to come out in successive crops during the course of the next few days so that individual lesions in all stages of development may be seen at any one time Some of the vesicles recede while other become pustular and collapse or rupture with formation of crust.

[illegible] almost as soon as they appear and within 24 hours [illegible]

Rarely, bullous hæmorrhagic or gangrenous varieties of chicken pox are met with and in these severe forms the mortality is high In the bullous variety the vesicles rapidly develop into large bulæ which burst and leave extremely tender and painful areas of raw skin. It is believed by some to be due to infection of the vesicles by virulent streptococci

In the hæmorrhagic variety hæmorrhages occur both into the vesicles and into the skin between the lesions Bleeding also generally occurs from various mucous surfaces especially the gut and the outcome is usually fatal

The gangrenous variety of the disease is generally encountered in weak and debilitated children, *especially those who have recently suffered from measles or scarlet fever* The pustules increase in size and black necrotic crusts are formed which, on separation leave sloughing ulcers

Complicati[ons]

Complications are entirely due to the infection of the cutaneous lesions with pyogenic bacteria and are responsible for mortality Post infectious encephalitis is very rare

Diagnosis is usually not difficult but severe infections in adults have to be differentiated from small pox

Treatment

There is no specific therapy and the treatment is on general lines Children should be isolated, but confinement to bed is not often necessary Light diet and attention to the bowels are often all that are required Calamine lotion allays pruritus which may accompany severe eruption, the application of creams prevents *cracking and abrasions of skin*

The immunity following an attack of the disease is usually complete and permanent, second attacks are extremely rare Convalescent sera, taken from patients who have recently recovered has been successfully used both in the prophylaxis and treatment of the disease It is specially useful in debilitated children exposed to risk of infection

[illegible]

attack of the disease confers a lasting active immunity The use of normal adults' serum in a dose double that of convalescent serum has also been recommended Further, preparations of globulins extracted from human placentas have been stated to contain the antibody and to be an effective prophylactic agent

19. Primary Atypical Pneumonia (Virus Pneumonia)

This condition has not yet been recognised as a separate clinical entity but comprises of a group of conditions characterised by pneumonic consolidations where no causative organisms either of the nature of bacteria or rickettsia or virus can be demonstrated in blood, sputum or lung puncture materials

Primary atypical pneumonia of unknown aetiology has been reported with increasing frequency from parts of United States and England During recent years, cases are also being reported from Kashmir and other parts of India

f
ymph

The current method of production of lymph for vaccination has the disadvantage that it is not possible to get a sterile preparation except after prolonged storage of the material in glycerine During storage the vaccinia virus is attenuated to some extent and this leads to occasional failures in vaccination. Various efforts have therefore been made to produce sterile vaccine material and these efforts have chiefly been in two directions. Potent vaccine filtrates have been produced by
Such filtrates could be *partly concentr*
long periods at freezing point witho
extensively tried for prophylaxis The
to grow the virus in tissue culture an
embryo The egg membrane lymph can
diminution in potency Using this mat
the lesion produced in rabbits and man
the calf *lymph* Sufficient evidence has
using egg membrane lymph for vaccinat

Besides compulsory vaccination in endemic and epidemic areas other methods should be adopted so as to prevent dissemination of the infected material from the sick person to those around him It should be realised that infective material exists in the eruption and may be carried through the air and persons coming in contact with the patient may them selves be *infected or carry and re*
laxis when a case occurs, is to
specially meant for the purpose
thoroughly disinfected Downie
vesicle will grow on the chorion al
or more, crusts from healing lesions kept in dark at room temperature yielded virus after 417 days The small pox patient should not be discharged from the hospital until all infected *epidermis is removed*

This depends on the strain of the virus which has produced the infection Mortality varies from less than 1 to 40 per cent depending on the care which the patient receives to prevent *secondary bacterial infection and complications such as broncho pneumonia*

18. Varicella (Chicken-pox)

Chicken-pox is an acute infectious virus disease which is characterised by
r in successive crops The onset is gradual and
of a general infection The disease for a long
mall pox

Chicken pox is extremely infectious in its early stages and has a world wide distribution in densely populated areas Children are the main victims, the disease being only rarely encountered in infants or adults It generally occurs in the form of small localised epidemics in small communities such as schools and childrens' hospitals The period during which it is contagious is not known with certainty but it is probably the first week or ten days of illness

The virus of chicken pox can be demonstrated in the vesicular fluid by suitable staining methods such as Giemsa's stain The inoculation of animals with material from cases of varicella has yielded negative results It has been found that from 5 days after the onset of the disease, antibodies appear in the serum which agglutinate the elementary bodies ... centrifuging fluid from the vesicles *The close relation of the viruses of*

As the disease is not fatal its pathology is not known The vesicles ... *superficial in the upper and middle portion of* the rete malpighii

cts

The incubation period is generally 14 or 15 days, but the patient may be infective for up to 24 hours before the appearance of the rash Prodromal symptoms are usually absent, the first *symptom* often being the appearance of a few macules or papules on the trunk Slight fever usually not higher than 100°F soon appears and there may be headache and sometimes vomiting The eruption first appears on the front and back of the chest and abdomen in the form of pink macules or papules which in a few hours change into vesicles The rash soon spreads to the inner side of the thighs the face *scalp and the upper arms* and thighs The mucous membrans of the mouth throat larynx, vulva or prepuce are not

infrequently involved The rash often continues to come out in successive crops during the course of the next few days so that individual lesions in all stages of development may be seen at any one time Some of the vesicles recede while other become pustular and collapse or rupture with formation of crust

The macules change into papules almost as soon as they appear and within 24 hours the papules change into vesicles The contents of the vesicles soon become turbid and the larger lesions may show dimpling or false umbilication On the second or third day these vesicles become pustular and during the next few days the pustules gradually dry up and scab formation appears In another few days the scabs separate The disease is generally benign and the mortality rate is practically nil

Rarely bullous, hæmorrhagic or gangrenous varieties of chicken pox are met with and in these severe forms the mortality is high In the bullous variety the vesicles rapidly develop into large bulæ which burst and leave extremely tender and painful areas of raw skin It is believed by some to be due to infection of the vesicles by virulent streptococci

In the hæmorrhagic variety hæmorrhages occur both into the vesicles and into the skin between the lesions Bleeding also generally occurs from various mucous surfaces especially the gut and the outcome is usually fatal

The gangrenous variety of the disease is generally encountered in weak and debilitated children especially those who have recently suffered from measles or scarlet fever The pustules increase in size and black necrotic crusts are formed which, on separation leave sloughing ulcers

Complication

Complications are entirely due to the infection of the cutaneous lesions with pyogenic bacteria and are responsible for mortality Post infectious encephalitis is very rare

Diagnosis is usually not difficult but severe infections in adults have to be differentiated from small pox

Treatment

There is no specific therapy and the treatment is on general lines Children should be isolated, but confinement to bed is not often necessary Light diet and attention to the bowels are often all that are required Calamine lotion allays pruritus which may accompany severe eruption, the application of creams prevents cracking and abrasions of skin

The immunity following an attack of the disease is usually complete and permanent, second attacks are extremely rare Convalescent sera, taken from patients who have recently recovered has been successfully used both in the prophylaxis and treatment of the disease It is specially useful in debilitated children exposed to risk of infection

It has been found that if the immune serum is injected during the first five days after infection an effective passive immunity is produced which may persist for a month The dose for a child is double the number of ccm corresponding to its age in years, injected intramuscularly Usually a minimum dose of 15 ccm is recommended Further an injection even after the fifth day, *ie*, on the seventh to tenth day, tends to modify the subsequent attack The resulting mild attack of the disease confers a lasting active immunity The use of normal adults serum in a dose double that of convalescent serum has also been recommended Further, preparations of globulins extracted from human placentas have been stated to contain the antibody and to be an effective prophylactic agent

19. Primary Atypical Pneumonia (Virus Pneumonia)

This condition has not yet been recognised as a separate clinical entity but comprises of a group of conditions characterised by pneumonic consolidations where no causative organisms either of the nature of bacteria or rickettsia or virus can be demonstrated in blood sputum or lung puncture materials

Primary atypical pneumonia of unknown aetiology has been reported with increasing frequency from parts of United States and England During recent years cases are also being reported from Kashmir and other parts of India

Adolescents and young adults are mostly affected Seasonal distribution is variable The incidence is sporadic but may also manifest itself in epidemic or in endemic form Though the condition *is not highly contagious, it* can be transmitted by contact also Droplet infection is also reported

There are hæmorrhagic, interstitial bronchopneumonic patches *in the lungs* associated with acute bronchitis and bronchiolitis Microscopically, the alveolar septa are thickened and infiltrated with mononuclear cells The walls of bronchi and bronchioles are necrosed and infiltrated with polymorphonuclear leucocytes, their lumens filled up with acute inflammatory exudate Many of the alveoli contain *oedematous fluid and red blood cells*

The incubation period varies from 1—21 days or it may be longer The onset is often *insidious* with *fever usually between 100°—103°F, malaise* headache, muscular pains, chilliness and cough The most characteristic and distressing symptom is the cough which is dry and paroxysmal There is usually [illegible] the abdominal muscles result [illegible] n the cough is productive [illegible] sputum is expectorated The malaise and muscular pains may persist throughout the course of the disease

Usually the patients do not appear to be seriously ill and majority of them show little dyspnoea or cyanosis Pulse and respiration may be normal or moderately increased but the pulse rate is often slower in comparison to the height of temperature The physical signs in the lungs are indefinite Occasionally areas of dulness can be demonstrated by percussion and there may be fine or medium rales at the end of inspiration on auscultation

The leucocyte count is usually normal Erythrocyte sedimentation rate is increased Cold *agglutinins (autohaemo agglutinins) have been found in blood* from the second to the fourth week of the ilness Wassermann reaction may be possitive for a short time X-ray reveals in majority of cases an increase in both hilar shadows with areas of inflammation extending outward toward the periphery of lung field The lower lobes are most frequently involved and in majority of cases of both sides There may be pleural effusion usually serous or purulent in about 10% of cases Meningism, encephalitis, thrombosis of leg *veins and polyarthritis are some of the rare complications* The prognosis is usually good, the mortality rate being definitely below 5—10 per cent

Treatment Until very recently, the treatment of virus pneumonia was purely symptomatic For the control of cough, sedatives, expectorants or steam inhalations with Tinc Benzoin Co, were used with some effect Sulphonamides and Penicillin were completely ineffective in these conditions Some improvements have been reported from empirical use of Quinine hydrochloride in doses [illegible] *broad spectrum antibiotics, such* [illegible] n tried against these condi[illegible] given by mouth in doses varying from 1 1 5 gms daily, the drugs usually produce a fall of temperature and an improvement of symptoms within 24 72 hours It is usually given in divided doses at 4 or 6 *hourly intervals according to necessity No relapses have* been observed Usually there are no side reactions excepting some mild gastro *intestinal* disturbances with aureomycin Further clinical trials are however necessary before their full value against these conditions can be definitely assessed From the present state of our knowledge, it appears that terramycin and aureomycin are drugs of choice in the treatment of *primary atypical* pneumonia of the virus type

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PART VI

REMEDIES USED AGAINST MISCELLANEOUS TROPICAL DISEASES

CHAPTER I

ANIMAL POISONS

SNAKE VENOMS CLASSIFITION OF SNAKES AND THEIR IDENTIFICATION POISONOUS AND NON POISSONOUS SNAKES BIOCHEMISTRY OF VENOMS PHARMACOLOGY OF SNAKE VENOMS CHARACTER THE VENOM OF INDIAN DABOIA AND OTHER VIPERS CLINICAL ASPECTS THE MECHANISM OF SNAKE BITE THE PATHOLOGY AND THE CHARACTER OF THE WOUND SYMPTOMATOLOGY DIFFERENTIAL DIAGNOSIS BETWEEN VENOM COLLAPSE AND FEAR SHOCK TREATMENT GENERAL ANTIVENENE OR SPECIFIC THERAPY TREATMENT OF SYMPTOMS RESUME OF THE ROUTINE TREATMENT OF SNAKE BITE—SCORPIONS SPIDERS INSECTS ETC —TREATMENT OF BITES AND STRINGS IN GENERAL

I Snake Venoms

Etiology

The subject of snake venoms is of special interest in India In a population of 400 000 000 at least 20 000 to 25 000 deaths occur every year from snake bites the fatality rate being 35 to 40 per cent The number of deaths from the same cause is likewise considerable in Burma Indo China China Australia Africa West Indies and Tropical America but the exact rate in these areas cannot be estimated accurately The temperate parts of the globe are far less severely affected In the U S A the recorded number of bites in 1928 and 1929 was estimated to be between 1 500 to 1 800 with a mortality rate of 5 per cent The highest mortality rate occurs in the tropical and subtropical climates due to the density of population of venomous snakes and lack of preventive and treatment measures in cases of bites In Europe the only poisonous snake is a variety of a small pitless viper its bite mostly produces local symptoms and is rarely fatal The most dangerous species to man are found in the tropical regions of Asia and Malaysia In India during the last 30 years or so a great deal of attention has been directed towards the classfication of different snakes the study of the chemical and bio chemical nature of their venoms their toxicity and the preparations of antivenines Interesting investigations have also been carried out in the venom

1 Classification of snakes and their identification

Most of the deaths reported from snake bite in India are from the bites of the Cobra (*Naja naja*) Indian Daboia (*Vipera russellii*) and *Phoorsa* (*Echis carinata*) The last in order come some varieties of Kraits which rarely bite though their poison is very deadly

The poisonous effect of a particular snake is dependent upon (1) the toxicity of the venom (2) the possession of fangs (3) the amount of venom present in each of the glands and (4) the dose injected. The snakes possessing anterior fangs are only to be regarded as poisonous to man

Classification

Wall (1913) classified all the snakes into three groups according to the shape and situation of the teeth in the

The important venomous snakes of the world belong to these four families the member of which possess enlarged anterior fangs by which the venom is injected into wound during the bite The four families can be further arranged in two groups —

I *Proteroglypha* which include *Elapidae* the cobras and allies and the *Hydrophidae* the sea snakes These have short fangs rigidly fixed in erect position to the anterior par of the jaw Elapidae family is the largest and has representative in all continents except Europe and Antarctic regions *Hydrophidae* are characterized by certain modifications chiefly flattening of the tail from side to side to assist in swimming Although very poisonous they are seldom encountered and are slow to bite They commonly occur in the northern waters of Australia.

II *Solenoglypha* which include *crotalidae*, the pit vipers and *Viperidæ* the true vipers These are equipped with long curved fangs set in movable bones and which can be folded back against the roof of the mouth when the snake is at rest and can be raised in an erect position when the snake strikes

The venomous snakes possess one or two functional fangs on each side of the mouth which are periodically shed but the snake is never without fangs

Besides the above there are rear fanged snakes *Opisthoglypha* whose poison injecting apparatus is less effecient than front fanged snakes They do not therefore present a serious problem so far as man is concerned These snakes are either too small or their venom is too mild to kill men

America—Rattle snakes (*Crotalus* and *Sistrurus*) and copper head (Angkistrodon moccassin and water moccassin A piscivorus) occur in Noth America Thirteen species or rattle snakes inhabit in the U S A ranging from two feet to 7 feet in length Diamond black rattler (*Crotalus atrox*) is one of the commonest species causing fatal bites The coral snakes occur in the south have a bright red colour and secrete predominantly neurotoxic venom

In Central and South America both Crotalidae and Elapidae are well represented and have powerful neurotoxic venom Crotalus d durissus attains a large size Fer de lance or *Barba amimarilla (Bathrops atrox)* attains a length of 8 feet and has hæmotoxic venom This snake along with jumping pit viper (*B nummifer*) is responsible for most of the bites The well known bushmaster *(Lachesis mutaq* one of the largest pit vipers occurs in the lower parts of Central America

Europe—Most of the species belong to gennus vipera of *viperidae family* In Northern Europe they are small in size rarely exceeding two feet in length and have a hæmotoxic venom More dangerous forms occur in Southern Europe

Africa—Viperidæ represented by large headed puff adder *(Bitis lachesis)* also and *B gabonica* and *B nasicornis* occur Several species of cobras genus Naja the genus *Dendroaspis* the aquatic cobra of the genus *Boulengerina* inhabit the rare forests of equatorial Africa They have neurotoxic venom

Asia—Russell's viper pit vipers *Trimeresurus gramineus* and *T mucrosquamatus* are responsible for the greatest number of bites Of the genus Flapidæ the king Cobra (Hemadryad hannah) occurs in Burma

Australia Elapidae family is most developel here and is represented by sixty species

... the maxilla is very small freely movable the front tooth on each ... On examination ... the roof ... cealed the

reserve fangs

2. Poisonous and non-poisonous snakes

The snakes constitute a large and important element in the Reptilian fauna of *India* and there is no known family of living snakes which is not represented in this country The large number of deaths amongst domestic animals and human beings caused by the bite of poisonous species of snakes has focussed much attention on this group Zoologists and medical men have attempted to provide intelligible guides to enable lay people to distinguish at sight the poisonous from non poisonous snakes Amongst the commonest

TABLE

(Modified after Gharpurey's table)

Snakes

- Tail compressed side ways and flat *(Sea snakes, poisonous)*
- Tail cylindrical and not compressed *(Land snakes, poisonous and non poisonous)*
  - Small scales on the abdomen as well as on the back. *(Non poisonous)*
  - Abdominal scales not extending right across it *(Non poisonous)*
  - Abdominal scales covering the entire width of the abdomen *(Poisonous and non poisonous)*
    - Small scales on the head *(Non pit vipers poisonous)*
      - Two rows of wavy bands on back, Government arrow mark on head *(Echis carinatus)*
      - Three rows of oval spots on back. Russells viper
    - Small scales on the head, a loreal pit between the nose and the eye Pit viper *(Poisonous)* {*Ancistrodon himalayanus*, *Ancistrodon hypnale*}
    - Shields on the head Cobras and kraits *(Poisonous)*
      - 1. Third supra labial touches the eye and the nostril Cobras and coral snakes *(Poisonous)*
        - Neck with hood and markings Cobras.
        - White coral coloured spots near the vent Coral snakes
      - 2. Scales in the central row on the back are enlarged and hexagonal and coloured bands or half rings across the back Subcaudals undivided Only four infra labial scales and the fourth is the largest Krait *(Poisonous)*
      - None of the characteristics mentioned in no 1 or 2 *(Non poisonous)*

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species met with in India may be mentioned the carpet snake (*Lycodon aulicus*) the rat snake or dhaman (*Ptyas mucosus*) the grass and the water snakes (*Rhabdophis stolatus* and *Nerodia*), the tree or whip-snake (*Dryophis mycterizans*), the cobra (*Naia naia*) the krait (*Bungarus candidus*) (Hydrophinæ with a strong coasts, the most widely dist latter is known to be the not so well known but whi (*Uropeltidæ*) are peculiar small worm like subterrane Empire Of the latter (*Ty* rock snake of India is *Pyth* charmers in this country is *Eryx jaculus* which lives in sandy tracts of ... N W India *Cerberus rynchops* lives in mud on the banks of large rivers and estuaries of the Indian region and feeds on fish The raj samp or banded kraits (*Bungarus candidus*) of North India are common all over the country and are very destructive to life The king cobra (*Naia bungarus*) is confined to parts of south and eastern India Burma and the Andamans It is of ... snakes *Echis carinata* another fierce snake ... desert sandy tracts of India The pit viper ... only e g *Ancistrodon himalayanus* common ... in Ceylon and Western Ghats

3. Biochemistry of Venoms

The snake venoms are chemically complex substances and only during recent years some light has been thrown on their composition The question as to what constituent or ... focused

protein molecules form ...

... venom has been known to contain some active enzymes Experiments with the ... solved ... been ... oms ... mes

The proteolytic enzymes are held responsible for severe hæmorrhagic and destructive effects at the sites of the bites of the viperine snakes some of the hæmorrhagic effects in the viscera and the coagulant properties of venoms The proteolytic enzymes may also contribute to the hypotensive action of snake venom by damage to vascular endothelium with escape of blood from circulation and possibly also by the liberation of histamine

... action and

Briefly the following toxic principles occur in venoms —

1) *Neurotoxins* which act on the respiratory centre in the medulla or through their action on the spinal centre on the voluntary muscles some impair visual functions The venoms rich in this respect are of tiger snake and death adder of Australia common krait and cobra The venom of tropical rattle snake is rather unusual in having predominently neurotoxic principles

(2) *Cytolysins and proteolysins* These have marked local action and destroy cells producing swelling necrosis sloughing and gangrene of the tissue and intense pain. Russells viper is intensely cytolytic while venom of bushmaster copper head and water mocassin are markedly proteolytic in their action

(3) *Hæmolysins Hæmorrhagins Hæmocoagulins* These cause extensive destruction of

Generally the venom from Elapidae has more anticoagulant action and viperidae and crotalidae more coagulant properties

The venoms are thus divided into two groups (1) neurotoxic and (2) hæmotoxic on the basis of predominance of these principles
With a few exceptions the viperdae and crotolidae venoms are hæmotoxic and those from Elapidae are neurotoxic

4 Pharmacology of snake venoms

(1) Characters

The venom when fresh is a transparent and clear fluid. It is faintly acid in reaction and its consistency varies from that of water to that of the white of an egg. Cobra venom is a transparent amber coloured or almost colourless fluid having a specific gravity of 1110. It is slightly disagreeable in taste. The crotalus venom varies from a pale to an emerald green and orange or straw colour. It has no taste and its specific gravity varies from 1030 to 044. The venom rapidly becomes alkaline in reaction on account of the disappearance of a volatile acid during decomposition. When dried under a bell jar on concentrated sulphuric a... yellowsh... mainly ... cytolysin neurotox... vasomo... or below — *Physical*

Chemical

Class	Nervous system	On blood and blood vessels		
		Hæmolysis	Coagulation	Hæmorrhages
Hydrophidæ (Sea snakes)	Paralysis of resp centre & muscular system	very slight	slight reduction	Nil
Colubridæ (Cobras)	do	moderate	Nil	Nil
Viperinæ (True vipers)	Paralysis of vasomotor centre	pronounced	Intravascular clotting in high concentration and incoagulability in low concentration	Very pronounced
Crotalinæ (Pit vipers)	1	do	Intravascular clotting less pronounced coagulability pronounced	do

The venom is secreted by supralabial glands situated one on each side of the head behind the orbit. These correspond to parotid salivary glands in mammals. The contraction of the temporal muscles in the act of biting expells the poison from the glands which is further conducted by a duct to the base of the fang

Acton and Knowles (1914) found that an adult cobra of 4 feet 2 inches injects about 213 mgm of the venom at a single bite while the M L D of cobra venom for a man of 60 kilos is about 15 mgm causing death in three hours. This shows that

the cobra generally injects about 10 to 15 times the M L D In the case of a common krait about 5 mgm is injected at a single bite The M L D for monkeys is 0 15 mgm and *for a man it is estimated to be 1 mgm, it therefore injects about 5 to 10 times the M L D*

Fitzsimons observed that two drops of venom usually comprises a fatal dose for a strong man An adult cobra or a mamba is capable of discharging as much as 8 to 10 drops of venom at a bite It is obvious, therefore that there is a little hope of recovery for a person who is bitten by an adult cobra and when the later has *given a satisfactory bite* On the average an adult cobra injects about five to six drops of the venom at a single bite

(2) The venom of Indian Daboia and other vipers

The average yield of dry venom obtained *after several milkings of some of the important* species of snakes are —

Indian Cobra (*N naia*) 250-350 mgm, Indian Russel s viper (*Vipera russellii*) 200-300 mgm, Black Tiger Snake (*Notechis scutatus*) 70 mgm, death adder (*Acanthophis antarticus*) 40 mgm, copper head (*Densonia superba*) 21 mgm, black snake (*Pseudechis porphyriacus*) 30 mgm, brown snake (*Demansia textilis*) 2mgm, North American copper head 45-65 mgm, North American moccasin 90-150 mgm South American fer de lance 80-160 mgm, South America bushmaster 300-500 mgm African mamba 50 to 80 mgm African puff adder 70-120 mgm

Daboia venom

oms

Acton and Knowles (1914) showed that daboia venom contains a *hæmorrhagin* which destroys the endothelial cell lining of the finer blood vessels and consequently gives rise to ecchymosis and extravasation of blood, the convulsions seen early in viperine poisoning being due to small hæmorrhages in the cerebral cortex a *cytolysin* which dissolves the *red blood corpuscles releasing a fibrin ferment (thrombase) which causes intravascular* clotting pulmonary embolism and death from asphyxia The slow and delayed symptoms after the venom is injected are probably due to low dosage The fatal dose for a monkey

[illegible] nom of the Russell s viper and [illegible]
t of poisoning and are very extensive in
nd irregular respiration convuls on and
l centre owing to deficient blood supply
show symptoms of petechial hæmorrhages
full of dark blood and the left side is
coagulated In animals which have died
[illegible] mottling of the cortex and extensive

hæmorrhages The serous cavities such as the pericardium the pleura and the peritoneum are full of sanguinous fluid probably produced by injury to the delicate endothelial cells of the capillaries leading to excessive leakage of the blood

[illegible] and [illegible] at the
site [illegible] ially
the [illegible] idely
dilat [illegible] iown
by [illegible] the

action is prolonged these measures are of no avail since [illegible] ility of the vessel walls to the portein constituents *of the blood is lost The capillary leakage* goes on to such an extent that anything injected leaks out of the vessels The symptoms of shock in daboia poisoning are not due to reflex impulses but are due to the local dilatation of the capillaries of the splanchnic area

5 Clinical Aspects

(1) The mechanism of Snake bite

There are four *distinct phases* when a poisonous snake bites

(1) *The strike* In this phase the snake throws itself forward with great rapidity and violence the distance covered not generally exceeding one third of its length The vipers strike with greater velocity than the colubrides some of which—especially the hooded species—raise the head from the ground, so compensating to some extent for the limited mobility of the fangs

pterygoid muscles The fangs of the colubridae are invariably grooved and are generally shorter than those of the viper and their capacity for forward rotation is much more limited

a
te

Knowles In the vipers there is an entirely different anatomical arrangement of muscles acting on the venom gland, expulsion of its contents is instantaneous and independent of fixation of the lower jaw

(4) *Retraction of the fangs* Immediately following the insertion of the fangs and actually accompanying the discharge of venom contraction of the retractor muscles (the parieto and spheno palatine and the internal and external pterygoids) which operate on the pterygo-palatine transverse arch occurs dragging the elevated fangs downwards and backwards through the tissues

(2) The pathology and the character of the wound

Wound after Snake bite

The sha e and the severity of the
the anger with which the snake attacks
happens to bite through thick clothes, b
that made by a large hypodermic needl
⅜ to 1 inch apart

Pain Immediately after the bite pain is usually local severe and scalding in character Later the pain may increase and radiate along the whole length of the limb followed by numbness and heaviness of the bitten limb

Swelling It usually occurs within 10 to 20 minutes after the bite and is intense, brawny and indurated in character *The swelling is very painful* does not pit on pressure and rapidly extends higher up along the body

Discoloration The skin may become bluish black in colour due to the action of the venom on the hemoglobin and may end in blisters abscess and gangrene.

Act of the Bite.

In the act of the bite the fangs peretrate the tissues and the venom is injected synergistically The snake grips the tissues tightly in its mouth the subtemporal muscles contract with great force, the levator vagina of the palate is elevated and the venom glands are squeezed The venom finds its passage along the

highly developed
The injected
This irritant
on congestion
of the venom
and then make

(3) Symptomatology

Symptoms

The symptoms produced by venoms generally differ according to the toxic principle contained In the predominantly neurotoxic venoms the local reaction is slight there being only burning pain slight œdema and congestion round the wound Systemic

symptoms are produced either immediately or after a few hours these consist of nausea vomiting headache faintness lethargy and drowsiness these are soon followed by muscular weakness ataxia and paralysis later signs of bulbar paralysis e g difficulty in swallowing and speedily failing respiration and cyanosis and death from stoppage of respiration If dose is small symptoms disappear rapidly In case of hæmotoxic venoms the local reactions are severe *e g*, pronounced pain swelling extensive hæmorrhages this may be followed by local gangrene. Systemic symptoms which are generally delayed for a few hours are nausea vomiting sometime diarrhœa Hæmorrhages occur through all mucous membrances—gastro-intestinal tract bladder conjunctiva etc Extreme thirst dyspnoea, *fever extreme hæmolysis, all the symptoms of shock, i e* collapse coma and death Mild cases recover in a day or two

The Indian Commission on snake bites in (1886) estimated that the average lapse of time between the infliction of a bite and the cessation of the respiratory function varies from 10 minutes to one hour (average 42 minutes) without artificial respiration In the case of the Russell s viper death takes place in 2 to 7 days usually due to paralysis of the vasomotor centre and circulatory failure Death occurs from secondary shock while in the case of *Echis carinata* death is due to multiple hæmorrhages and consequent failure of the circulation and it may be still more prolonged

(*a*) *The cobra and the krait* The local symptoms consist primarily of pain at the site of the bite radiating along the limb and later followed by œdema, paresis and numbness In man following a toxic dose ...
the patient becomes drow...
oms peculiar tremors occur all o...
collapse giddiness reeling ...
muscles and blindness are ...

... Northern India is one of the most deadly snakes it has also been observed that the patients lose the taste for powdered chillies raw onions and bitter *neem* leaves after a cobra bite The symptoms produced are similar to those produced by the cobra venom but ...

coma, the recovery is complete and no sequelæ follow

(*b*) *V*... ...toms are more prominent and severe in ... placed on his skin He may even scre... d ecchymoses and persistent oozing of ... proportionately more profuse as compar... a marked fall of the blood pressure ... pupils which are insensitive to light The loss of consciousness is more or less complete from which temporary recovery sometimes occurs Should the effect of the diffused toxins wear off the local condition of the wound becomes aggravated In severe poisoning convulsions set in indue course and death ensues from failure of the circulation The post mortem examination reveals congestion of the meninges and the lungs are full of fluid blood On incising the bitten area clotting and hæmolysis of blood are seen which give the appearance of a red currant jelly to the tissues In delayed and less poisonous cases blisters abscesses gangrene and secondary bacterial infect on may occur Multiple hæmorrhages extensive petechial spots epistaxis hæmaturia hæmoptysis subconjunctival hæmorrhages and purpura are not uncommon

6 Differential diagnosis between venom collapse and fear shock

The pain and fear may cause complete collapse and even death in certain cases Hence the differential diagnosis between shock from fear and actual collapse from venom is

necessary The difference between fearshock and venom collapse are given in the following table —

Fear shock	Venom collapse
1 Onset of weakness is sudden	1 Onese of weakness is slow and gradual
2 Partial or complete loss of con sciouesness	2 Recumbency voluntary after some time owing to gradual loss of power of legs
3 Involuntary prostration and fainting	3 Consciousness not impaired
4 Syncope i e pallid face cold skin and feeble pulse	4 Heart not affected Face natural and later on livid, skin warm and pulse normal
5 Breathing shallow sighing weak and hurried	5 Breathing gradually becomes more laboured and quickened gasping to wards the end
6 No paralysis	6 Gradual weakness from legs upward s later paralysis head and eyelids droop, swallowing difficult, lower jaw drops, saliva dribbles and articulatior difficult
7 Death from failure of respiration	7 Death from depression of heart

The fear symptoms always appear more quickly than the symptoms following snake poison In deciding whether the symptoms are really from snake bite practitioners should be guidd entirely by the local swelling the presence of blood and serous discharge from the bite and the severe and burning character of the pain The would swells rapidly but oozng of blood and serum continues from the fang punctures

7. Treatment

(1) General

From time immemorial snake charmers all over the world have claimed the ability of overpowering snakes They allege that they possess specific remedies against the poisons either in the form of charms or organic drug substances sometimes obtained from the body of the snake itself which possess the power of extracting the poison out of the wound The indigenous medicine in India has a long list of drugs claimed to possess specific antidotal properties against snake poison Mhaskar and Caius (1931) tested about 300 of such reputed remedies but none of these proved effective The author has received a large number of preparations and secret remedies consisting of leaves, powders, pills snuffs and eye salves which are claimed to be effective remedies against snake bite But they fail to neutralise or counteract the effect of the venom in experimental animals The methods of administration recommended for these cures appear to be rationally unsound as it is highly improbable that the rapidly acting venom will be neutralised by giving the drug by the mouth or application to the mucous membrane of the nose and *conjunctiva* or the skin The venom of most of the snake when injected intramuscularly is absorbed into the general circulation within 20 to 30 minutes and within a few minutes by the intravenous route Most of the venoms have a selective action on the vital centres and fatal effects occur so rapidly that the patient is dead before any help is possible It follows therefore, that to be effective at all the treatment *Indigenous medicines*

should be vigorously and promptly applied and it is only in the case of locally acting and slowly absorbed venoms that such methods could be of any use

of

On a patient being brought for treatment for snake bite, it should be ascertained whether the snake was seen or killed and identified In this connection it is necessary to find out, (a) has the snake actually bitten and (b) was the snake a poisonous one The first thing to do is to tie a proximal ligature on the limb and then to examine the area of the supposed bite If there are no fang marks and no venom on the skin then obviously there is no danger, but fang marks on the skin or venom on the mucous membrane or on the skin with scratches may be dangerous If the snake is available examine its mouth for the typical poison fangs in the anterior part of the upper jaw, also see if the head has the shape of an arrow as occurs in also see if the head has the shape of an arrow as occurs in vipers If the snake is found to be a non poisonous one the patient may still be suffering from acute, and even fatal shock due to fright but an assurance that the bite was not dangerous, and simple treatment for shock, will always rapidly allay the symptoms

of bite

If the snake has not been accurately observed or killed, the site of the bite should be closely examined for signs of the typical two punctures of the fangs a short distance apart, but it should be remembered that occasionally only one fang may have penetrated the skin, in which case the dose injected is likely to be a small one If some time has elapsed after the bite, local swelling due to hæmorrhagic effusion will be present, and this is likely to be greater in viperine than in colubrine venoms but on incising the bitten area some efffusion will be evident within a few minutes after the bite In any case, treatment should be applied at once without waiting for symptoms of poisoning to appear as by delay the chance of saving the patient is likely to be lost When dealing with a case of bite from a poisonous snake, efforts should be directed firstly to prevent absorption of the poison and secondly to neutralise as far as possible its toxic effects Thus ligature, burning and suction of the wound are some of the very antique remedies which have been practised in India for quite a long time and number of other schemes have been practised

The virulence of the poison depends upon the quantity of the venom injected and the size of the animal The same quantity of the poison will thus have a more serious effect upon a child than upon an adult The absorption of the venom depends upon the depth at which the venom has been lodged during the act of the bite and also depends upon the vascularity of the area bitten Wounds are dangerous if near the face neck upper arm, trunk and thigh and less dangerous if on the toes of the feet or fingers The smaller the quantity of the poison introduced into the circulation the milder the symptoms The first indication for treatment is therefore to
into the general circulation
identification of the snake a
non poisonous snakes the bitten area may be simply cleaned and treated aseptically

The treatment of snake bite has been divided by Metcalfe (1927) into — (a) Preventing the passage of snake poison into the general circulation (b) neutralising the venom at the site of the bite, (c) neutralising the venom that has been absorbed into the general circulation by specific antiserum treatment, and (d) the treatment of the special symptoms and secondary complications

The prevention of the passage of the poison into the general circulation The methods consist in application of a ligature incision of the wound cauterisation and suction of the venom from the site of the wound

By ligature is meant the application of an elastic and a tight binder between the seat of circulation gained C

Ligature

the cord is loosened for a few minutes from time to time, careful watch being kept for the appearance of any constitutional symptoms, the onset of which calls for tightening of the ligature again It has been shown that 6 or 10 times the fatal do e of the venom of the black snake (*Pseudechis porphyriacus*) could be injected into the legs of a rabbit without fatal results if an elastic ligature is applied immediately after the injection of the venom the ligature in such cases was tight enough to obliterate the circulation for about 20 minutes On incising the itten area the blood and lymph were found to be clotted at the site showing that the poison is thus temporarily locked up and could only be absorbed slowly In the case of cobra and krait venoms which contain no fibrin ferment the ligature only delays the absorption of the venom as long as it is on and thus only prolongs the death interval In the case of saw scaled viper and the Russell s viper where the venoms contain a greater proportion of the fibrin ferment and a thrombase the ligature helps in fixing the venom locally by producing thrombosis and thus greatly reducing the absorption rate of the venom In case of lachesis it was shown in Brazil that the ligature is not indicated as it produced gangrene at the site of the bite

The method of application of a ligature The binder should always be applied to the limb possessing a single bone *e g* the upper arm and the thigh and not on the forearm calf wrist or ankle which possess more than one bone and consequently the deeply seated interosseous blood vessels between them cannot be completely compressed by the held of a tight binder The bandage should be applied within 10 minutes of the bite and it should be tight enough to obstruct the lymphatic and venous circulation but t should not obliterate the arterial pulse If a rubber tourniquet is not available a thick string an elastic rubber tubing belt *dhoti* (loin cloth) turban or even a waist band may serve the purpose The bandage can be tightened by inserting a piece of stick between the ligature and the limb and twisting it on the ligature in a corkscrew manner when the ligature is adequately tight the stick is kept in place by inserting one end under neath the ligature It is loosened after about half an hour to allow the fresh blood to enter it and when the parts become pink the binder is tightened again This procedure should be carried on every quarter of an hour so as to avoid first aid intervals

Effective Ligature

The ligature is obviously made for delaying the passage of the venom into the circulation and thus extending the precious time for other active measures *Effective ligature must remain the first and the foremost step in the tr atment of snake bite*

The second form of local treatment of value is the immediate and free incision into the site of the bite and its neighbourhood or after the application of the ligature in order to let out the poison and to prevent the further absorption of the venom into the tissues The skin and the subcutaneous tissues around the bitten area including the punctures of the fangs should be incised longitudinally along the muscle fi res and never across it The incision is made in two stages —

Incision of wound

(a) The primary incision It consists of cutting ⅛th to ¼th of an inch i e as

deep as the puncture of the fangs and is crucial in shape Care should be taken to avoid big vessels or nerves The effusion of the blood from the wound should be aided by squeezing the wound and by applying suction (*b*) Secondary incision After the primary, incision and suction the wound may be further deepened to the subcutaneous tissues, *i e*, about ¼ to ½ inch deep extending as far as the swollen margin If the bitten part is a limb the incision should be circular, running all around the limb in the form of a 'bracelet' Two such bracelet incisions about one inch apart should be made proximal to the wound When the surface is flat as the back of the trunk, the incision should encircle the bitten and the swollen area The secondary incision should be along the distal margin of the swelling and the suction should be continued for some time If the swelling still increases, make another incision along the distal end of the fresh swelling and continue suction, for it is in the distal parts of the swollen area that the venom is more dilute and therefore is more likely to be absorbed into the circulation

he The sucking of the wound has been recommended by Celsus but it should only be done by the mouth if there are no ulcers on the gums palate tongue etc The ligature and the incision must be supplemented by suction The mouth is first rinsed with oil or warm *ghee* (clarified butter) and the wound sucked and spat out The vacuum caps or suction apparatus have proved to be far more efficient than the suction by the mouth A simple emergency suction apparatus can be improvised by attaching a rubber bulb to a glass funnel The breast pump or cupping glasses also serve the purpose It has been demonstrated experimentally that the venom can be removed from the tissues by the method of incision and suction Experimental animals after receiving as high as 4 M I D of the venom could be saved by this method if suction was applied within an hour of the injection The fluid sucked out contains the venom solution and is highly toxic if reinjected into another animal and it can be neutralised with antivenom sera *The suction is repeated after half an hour In the beginning* the sucked out blood is thick, dark and semiclotted in condition but subsequently it changes its appearance to a bright red colour due to hæmolysis and dilution with lymph

tion This drastic procedure has sometimes been used A burning coal or a red hot iron is applied immediately to the bitten area Strong alkalies, acids such as nitric, sulphuric and carbolic, silver nitrate or crystals of potassium bichromate have also been used as escharotics The disadvantage of this method is that as the burning only acts to a certain depth, absorption of the venom from the deeper layers cannot be prevented

This is another drastic treatment, but if done in proper time life may be saved It is the best remedy, especially in viper bite *It is not indicated in cases* ... mortality is very low, and its value is doubtful
the circulation within 8 to 10 minutes It is
and toes and when the patient is seen within
tion is usually done by the patient himself
as the cases rather late for medical aid

It has been demonstrated experimentally that venesection is of value in case ... from
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the venous return, but not the arterial flow, is placed in position immediately distal to the arterial ligatures An incision is made into one of the veins draining the bitten area and a succession of small blood lettings from the vein is carried out by lifting the arterial ligature for a minute or two and leaving the venous ligature in position This treatment is quite useful, particularly where antivenene is not available In an adult a pint and a half of the blood can be removed and if necessary replaced by transfusion or by giving an intravenous injection of a large quantity of gum in saline solution

Neutralising and fixing the venom at the site of bite It is clear that it is far more important and practical to destroy and neutralise the venom at the site of the bite before a lethal dose has been absorbed into the general circulation Moreover, if less than a fatal dose has been absorbed before the patient comes under treatment, the destruction of the greater part of the remaining unabsorbed venom may turn the scale The destruction of the venom locally is important in view of the uncertainty of the antivenene treatment, the amount of antivenene available to completely neutralise the large dose of the venom injected by a bite and the availability of an apparatus for intravenous injection Cobra venom is absorbed quickly but in case of viper bite one ampoule of the serum should be injected locally at the site of the bite, and half an ampoule a little above the wound and below the ligature

Chemical Reagents

About 200 chemical reagents have been tested, but their value in actual practice is limited. These remedies act by causing local coagulation and necrosis thus destroying both the venom and tissues The neutralising value of a chemical is greater when it comes in direct contact with large quantities of the venom and in high concentration. Chemicals are more suited for viperine than colubrine venoms

Potassium permangana

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syringe into
of the wound The needle should penetrate at least $\frac{1}{2}$ inch deep into the tissues The limb must be kept elevated and fomented with a hot and strong (3 to 5 per cent) solution of potassium permanganate The tourniquet should be kept in place as long as necessary but

Gold chlori

The use of
age and later by

Dihydrochloride of palladium It is said to have proved more efficacious tsan gold chloride under experimental conditions

Calcium chloride A 2 per cent solution can be injected locally and intravenously It is said to be useful in preventing hæmolysis and aids the healing process, it is indicated in cases of *echis* and *lachesis* bites

Hydrogen peroxide It has been shown that injections of 1 ccm of hydrogen peroxide solution within 9 hours of the bite can oxidise about 5 mgm *i e*, 17 times the M L D of the *Ancistrodon* per kilo weight of a rabbit Its action is similar to that of potassium permanganate.

Artificial respiration This is of value in colubrine poisoning if complete respiratory paralysis has not yet supervened With the employment of artifical respiration, life has been prolonged as longed as *long as 30 hours after cobra* bite Artificial respiration should be kept up as long as the heart goes on beating If the respiration fails, the administration of oxygen or carbon dioxide should be tried, the latter gas can be given by making the patient breathe *in and out* of a bag thus increasing the carbon dioxide intake In case of viperine poisoning where death is due to cardiac failure and secondary hæmorrhages artificial respiration is useless

(2) Antivenene or Specific therapy

Usual amateur first aid treatments and at times. drastic and have worse consequences than the untreated cases

Because of the antigenic nature of different venoms, polyvalent serums have been prepared which are effective against a number of antigenically related venoms Institutions in America, Europe, Australia and Asia produce these antivenenes to deal with snake bites of the particular localities

The first scientific attempt to produce an artificial immunity was made by Sewell in 1887 in pigeons when by small repeated injections he raised their resistance so high that they could resist 10 times the lethal dose of the venom of a crotaline snake In 1892 Calmette showed that by repeated inoculation of venom heated to 80°C, a certain amount of resistance could be developed in animals He also demonstrated that an antitoxic serum against cobra venom could be prepared by repeated injections of gradually increasing quantities of venom into horses. It was later shown that antivenene has a specific action against the venom employed for immunising the animal The hypothesis was put forward that antivenene is of the nature of a precipitin serum and acts by forming a precipitate with the specific venom Noguchi and Madsden succeeded in producing antisera by immunising horses with venom after the toxophorous group of the molecule has been destroyed capable of neutralising the *hæmorrhagin of the crotalus venom* The anticobra serum supplied by Calmette had some power of neutralising the venom of sea snakes the king cobra and the common krait but not that of banded krait, which has a partial viperine action It is believed that active immunity against snake venom is often not so exclusively specific as was once supposed, *the high resistance of animals immunised to one species of* venom to other species of allied venoms being due to the similarity of venom in toxic constituents and to the close serological relation of the snakes

Antivenene in India is prepared at Kasauli with the venoms collected at the Haffkine Institute Bombay in the form of Lamb s mixed cobra and Russell s viper antivenene This preparation is reported to be strictly specific for cobra and daboia venom but its efficacy also extends to the poisons of the closely allied species The Pasteur Institute Paris prepares three antisera against the venoms of different snakes These are (1) ER for European snakes (2) AN for African snakes (*colubridæ* and *viperidæ*) (3) AO for West and [illegible]

as well as [illegible]

The antivenene remains thermostable at 60°C for five minutes but is completely destroyed when the temperature is raised to 65°C or above due to coagulation of proteins

Detoxications

Detoxication of venom The great toxicity of ophidian venoms has made the production of specific high titre antivenenes from horses a prolonged hazardous and decidedly expensive affair so that any such process as detoxication of venom with simultaneous preservation of

injuring the neurotoxin

Preparation

Method of preparation The technique of production of antivenenes is a complicated one owing to the now generally accepted fact that the antigenic substance contained in snake venoms are on the whole highly specific Horses are used for the production of the antivenenes The immunising process must be carried out very cautiously owing to the great sensitivity of this animal to the venoms The venom from a living snake is desiccated over sulphuric acid in vacuo and a weighed quantity is dissolved in sterile water and injected subcutaneously into horses selected for the purpose In the preparation of anti daboia serum the venom is sometimes emulsified with sterile lung tissue before injection in order to fix the hæmorrhagin principles The M L D of cobra venom for the horse is 25 mgm and therefore the first immunising dose is much smaller than this This is gradually increased until the animal is able to tolerate 1 to 2 gm of the dried venom at

1 ccm should neutralise not less than 1 mg of daboia venom and 0 5 mg of cobra venom Higher titres are usually obtained and 1 ccm may neutralise 3 to 5 mg of daboia venom Taylor (1940) suggested that the potency of antivenene should be expressed in terms of the amount of venom it is able to neutralize and in terms of units as in the case of other anti toxic sera The determination of the potency of antivenene is carried out on the basis of the number of certain lethal doses that are neutralized The therapeutic efficacy of the serum s estimated by titrating it before filling it into ampoules

Concentration of antivenene In snake bite the biting snake frequently remains

utilizing the sodium sulphate process

vles (1915) Caius Iyengar Naidu and Ahuja (1933) The ammonium sulphate

The antivenomous principle can be concentrated

before injection The Lyovac serum package contains the powdered serum syringe containing 10 ccm of distilled water 1 ccm ampoule vital of normal horse serum diluted 1 10 for testing and desensitizing and a small ampoule of iodine for sterlizing the skin

(4) Resume of the Routine Treatment of Snake bite

A *The first aid or immediate treatment* (1) The first aid treatment is used if the patient is seen within ten minutes of the bite Secure absolute [illegible] a few inches proximal to [illegible] The ligature should be [illegible] irculation The part of limb having a single bone is the best site for ligature

Shock Symptoms of shock usually develop in viperine poisoning due to destruction of the blood cells, vascular lining of the blood vessels persistent hæmorrhage destruction of the liver and the kidney cells vasomotor depression general sepsis infection, œdema and septicæmia Our experimental work has shown that in such cases a dose of adrenaline chloride is the best drug and 1 ccm of (1 1 000) solution should be injected intramuscularly and repeated in an hour if necessary Pituitrin is also useful Blood transfusion calcium injected intravenously, hæmoplastin normal horse serum and adrenaline are indicated A cup of hot black coffee is the best and the safest beverage Aromatic spirit of ammonia may be necessary to revive the patient Small doses of alcohol and strychnine may be given as stimulants but the practice of giving enormous quantities of alcohol cannot be too strongly deprecated Camphor in ether and pituitrin may be given hypodermically as general and vascular stimulants Rogers has advocated on physiological grounds the employment of adrenalin in viperine poisoning In case of snake bites in which the toxins have a marked paralytic action upon the vasomotor centre 1/16 gr of strychnine intramuscularly has been advised to stimulate the spinal centres Cocaine and morphine have been used locally and hypodermically to relieve pain Sparteine ⅛ gr digitalin 1/60 gr pilocarpine ⅓ to ½ gr and lobeline ⅛ to 1 gr have all been tried to steady the pulse

(2) If the bitten area is a finger or a toe apply a ligature above and amputate the bitten part within 10 to 15 minutes

(3) If the bitten area is a flat surface or is very vascular immediately incise it about ⅛ to ¼ inch deep and ½ inch long and forcibly express the blood and fluids as much as possible and apply suction cups or breast pump The first few drops of bloody serum contain much venom Suction on cuts should be kept constantly for one hour The opening of the wound and constant flow outwards prevents infection especially with Cl welchii and tetanus but antisera for these should also be given with antivenene

(4) [illegible] should be removed and repla[illegible] le entirely round the limb [illegible] maintained for 30 to 40 minutes out of each hour for about fifteen hours While resting the whole limb should be wrapped with heavy compresses which should be kept hot and wet with saturated magnesium sulphate solution

(5) Give stimulants like spirit of sal volatile (spt ammon aromat) 10 to 15 drops in an ounce of water coffee etc Keep the patient in bed If necessary give an injection of morphine to relieve pain

(6) Reassure the patient that the danger of the snake bite is usually overrated and that ⅔rd of all the bites are usually from non poisonous snakes and therefore there are more chances of recovery and less of serious consequences

(7) To replace fluids lost by sweating, vomiting and suction, give 500 to 1 000 ccm of 5 per cent glucose solution every few hours In severe cases one to three blood transfusions are essential to get over shock and have proved life saving Repeated blood counts and blood pressure readings give indication of seriousness of the case

B *Specific treatment* (1) By the time the physician arrives there has usually been much delay, and hesitation and indigenous remedies have been applied His responsibility, therefore, is very great life is in imminent danger and death may follow rapidly he has therefore to decide quickly and act quickly If the patient is seen early and if the bite was from a viper, he should examine the parts, tighten the ligature and excise the area

(2) Infiltrate the bitten area with 5 to 10 ccm or more of the antivenene Dudley Jackson (1944) recommends not less than five of 15 ccm ampoules of antivenene injected into and around the area of bite Another five ampoules are injected subcutaneously into the arm thigh or abdomen Suction should be resumed one hour after the serum is injected locally The serum should be left for one hour locally in the tissues to neutralize all the venom *Antivenene*

The injection of antivenene should be repeated 3 or 4 hours later together with intravenous injections of glucose and blood transfusions If blood pressure is falling there is profuse perspiration, weak pulse and other symptoms of shock, as many as fifteen ampoules of antivene may have to be given to turn the tide

(3) Inject specific antivenene as soon as possible after the bite In cases of cobra or daboia bites inject 80 to 100 ccm of antivenene intravenously within 20 to 30 minutes and give still larger doses if venom intoxication is coming on With sera concentrated four times a dose of 50 to 150 ccm should save every case if given within ½ to 1 hour of the bite If intravenous administration is difficult, it may be given hypodermically into the sides of the abdominal wall

(4) Inject antistreptococcal polyvalent serum as dental and oral sepsis is common in snakes Inject intravenously 30 ccm of a 2 per cent solution of calcium chloride thrice daily, give a saline purge and ensure perfect rest

The common errors in treatment are —

(1) Not deep enough incisions (these should go deeper than the skin)
(2) Too few incisions usually 100 to 150 are necessary
(3) Non transfusion of blood for want of suitable donors
(4) Too little antivenene
(5) Failure to recognize gas gangrene

Fatalities generally occur 15 to 48 hours after bite if treatment is not through

(II) SCORPIONS, SPIDERS, INSECTS, ETC.

TREATMENT The principles that guide the treatment of snake bite apply in general to that of scorpion sting A proximal ligature incision of the wound and sucking out of the venom and application of potassium permanganate are useful as in the case of snake bite If possible immediate injection of immune horse serum will be very efficacious Washing and bathing of the part with weak solution of ammonia or borax and local injection of colloidal manganese may be tried Five to ten min of a 5 per cent solution of cocaine subcutaneously in adults and 1 to 5 min in children around the site of the wound help in relieving the pain Eucain and stovaine may be conveniently substituted Tyrosin and juice *Potassium permanganate*

of dahlia are said to have a *neutralising* action on the venom Buchmann considers local injections of 1 per cent solution of tutocain in 2 ccm doses, given *subcutaneously* to be a good remedy Almost magical relief of pain after a *few whiffs* of chloroform have been reported The pain does not recur and is not due to the central anaesthetic effect of the anaesthetic

Antiscorpion serum Metchnikoff (1901) observed that the blood of the scorpion is distinctly antitoxic against the scorpion venom Todd (1909) prepared an antiserum from the Egyptian scorpion and showed *that it acted both prophylactically and curatively in animals* and in man Employed curatively it relieved the intense pain of scorpion bite Antivenene against scorpion sting is prepared at the *Butatan Institute* in *Brazil* in the Pasteur Institute in Algiers the Lister Institute, Elstree England and the Behring Institute in Germany The scorpion serum is *not prepared in India for there* appears to be no necessity for it The antivenene prepared at Kasauli (India) against cobra and daboia venom imparts a certain amount of protect
the venom of
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that the venom of Algerian bees (*Apis mellifica*) has some immunising power against the scorpion venom (*Buthus occitanus*)

The action of scorpion anti venene is said to be reinforced by simultaneous injections of physiological saline 100 to 150 ccm being given subcutaneously or the antivenene may be diluted with equal quantity of saline

Spiders

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Medical text books devote very little attention to the spider bites But the bite of the black widow (*Latrodectus mactans*) is quite serious and may even prove fatal There is local pain as pin pricks followed by numbness of limbs rigidity distension of abdomen rapid and laboured respiration and symptoms of failure in 24 hours In rare cass there is cyanosis rapid respiration and death

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The venom has injurious effects on the isolated heart of the frog and the capillaries are injured this leads to marked transudation of fluid and œdema The venom acts on the central nervous system producing cramps and convulsion Locally inflammation is followed by *dry necrosis of the skin* There is severe pain at the site of the bite followed by radiating pain and swelling in the whole limb sweating palpitation and rise of temperature are present Kellaway (1934) reported symptoms in man are those of overwhelming shock There is a sharp local pain at the time of bite but no local pain at the time of bite but no local oedema soon there is pallor drenching sweat and collapes with a rapid feeble pulse vomiting and urgent dyspnoea The pupils are contracted and there is paralysis of accomodation Later an eruption may occur which consists of a general invasion by red lenticular spots non confluent and not disappearing on pressure Bronchial constriction plays an important part in determining the fatal issue *there may be* laryngo spasm and death is attended with acute pulmonary oedema and cardiac failure The picture resembles somewhat that of acute anaphylactic shock though there is no *local oedema The bite of spider Atrax robrustus* has resulted in fatalities in man

TREATMENT The main effort should be to prevent the absorption of the poison by

injection of a 25 per cent magnesium sulphate solution with marked benefit in the case of the 'Red back' spider of the Philippines, which is sometimes fatal. Magnesium citrate is given internally. This venom has a special predilection for the peripheral nerves and nerve end organs. Other symptoms produced are elevated blood pressure, weak pulse, general weakness and numbness, muscular pain and paralysis of the lower limbs. Brazil and Vellard have prepared a bivalent antivenene by immunising sheep and have demonstrated its thrapeutic efficacy in man, rapid improvement follows its use. The spider antivenene, in common with those derived from snakes and scorpions, is highly specific.

(III) TREATMENT OF BITES AND STINGS IN GENERAL

Itching and œdema occurs in susceptible individuals and are relieved by application of hot lotions and compresses of sodium bicarbonate. The liquid should be allowed to dry on the surface and application should be repeated till complete relief is obtained. Ether and alcohol also relieve symptoms. If symptoms are general give sodium bicarbonate internally and hot and cold compresses or ice pack may be applied locally.

Prevention Beds should be raised from ground and feet set in this containing water and kerosine oil mixture. Both the mats and ground should be thoroughly cleaned and steralized by spraying with kerosine containing pyrethrum or rotenone. All crevices and cracks should be treated in the same manner. The ground should be raked and mixed with arsenic or flouride powder in proportion of five ounces to ten square feet; the flour should also be sprayed with kerosine oil and pyrethrum mixture. Cyanide fumifation if concentrated kills both bugs and eggs but has to be applied carefully. All rodents should be eliminated especially in case of rat mites. Cinnamic aldehyde (one ounce in one gallon) enhances the repellant quality of the spray.

Ticks inhabit grass, low foliage, trunks of trees etc. and attach themselves to the feet and legs and climb upwards. Attack can be prevented by wearing proper foot and leg wear

yards are helpful.

Dusting of sulphur powder under the clothing and taking sulphur internally acts as preventive.

Tick bites can be prevented by careful daily inspection of the body when returning from the field. Even if a tick is found it does not infect till it has been there for some hours. Tick at the back of neck and head can be felt by passing hand over the area.

For chiggers lightly lathering the body with mild soap or grease acts as a preventive.

CHAPTER II

INSECTICIDES AND REPELLENTS

INTRODUCTORY DEFINITION, HISTORY, CLASSIFICATION OF INSECTICIDES—INORGANIC INSECTICIDES OF PUBLIC HEALTH IMPORTANCE PARIS GREEN, COPPER ARSENITE SULPHUR PHOSPOROUS MINERAL OILS—INSECTICIDES OF VEGETABLE ORIGIN PYRETHRUM, NICOTINE, ROTENONE AND ROTENOIDS—SYNTHETIC INSECTICIDES D D T ANALOGUES OF D D T, B H C. CHLODANE TOXAPHENE, ALDRINE. DIELDRIN, PHOSPHATE SERIES—SPECIAL INDICATIONS FOR THE CONTROL OF VARIOUS INSECTS—REPELLENTS

1. Introductory

(1) Definition

The term *insecticides refers to chemicals which are used for the control of insect pests* and is sufficiently comprehensive to cover every field of pest control namely agricultural medical and vertinary This chapter deals with Insecticides of Public Health importance

(2) History

The use of chemicals to *protect man from the attack of insects dates back as far as* the 18th century but it is only during the last fifty years that their use has increased steadily Examples of early use of chemicals for insecticidal purposes include arsenical baits *powdered pyrethrum flowers and various types of concoctions*

History The use of chemicals to protect man from the attack of insects dates back as far as the 18th century but it is only during the last fifty years that their use has increased steadily Examples of early use of chemicals for insecticidal purposes include arsenical baits powdered pyrethrum flowers and various types of concoctions

The use of dusts as stomach poisons for killing mosquito larvae represented the first practical advance in the Public Health field Roubaud a French Scientist recommended paraformaldehyde (Trioxy methylene) as a mosquito larvicide during the first quarter of this century His work inspired Barber and Hayne who initiated the use of Paris green

al powders as a larvicide practically all over the world

dult mosquitoes with pyrethrum extract and in recent

and potentialities of organic insecticides (particularly

the control of mosquitoe borne diseases but also a

The control of insect borne diseases is now in the

results achieved during the World War II and the recent campaigns (malaria and typhus control) all over the world have confirmed this belief

(3) Classification of Insecticides

Classification of Insecticides

Insecticides are usually divided into three groups (a) stomach poisons (*b*) contact poisons and (c) fumigants.

The first term is applied to chemicals which are actually ingested by the insects and death results from poisoning for example the feeding of mosquito larvae on Paris green

The term Contact poisons is applied to chemicals which kill only by intimate contact with the body of the insect Death of the insect occurs after penetration of the insecticide through the cuticle resulting in paralysis of the central nervous system The earlier forms of contact sprays included kerosene emulsions nicotine sulphate solution pyrethrum etc More recently DDT and other organic compounds have to a very large extent replaced the older formulations

Fumigants are chemicals which give off vapours having lethal effect on insects and include Carbon disulphide hydrogencyanide and sulphur dioxide They act both as respira t... and contact poisons

c ... e arl trary

2. Inorganic Insecticides of Public Health Importance

(1) Paris green

$Cu(C_2H_3O_2)_2 \cdot 3Cu(AsO_2)_2$ is a double salt of copper acetate and copper metaarsenite

It is a micro crystaline powder of emerald green colour practically insoluble in water A good sample of Paris green should contain over 50 per cent arsenious oxide and the particle size should be between 20-25 U

Formulations There are a large number of arsenical insecticides, but Paris green is the only compound which has been extensively used for the control of mosquito larvae It is mixed with an inert diluent which acts as a vehicle for its proper distribution Diluents ... for this purpose They ... at least 30 meshes per ... rs are mixed 1 2 per ... dusters and 33 per cent

... a suspension with water

Formulation

Kerosene oil	—	—	—	400 c c
Paris green	—	—	—	200 c c
Egg albumin		—	—	1 gm
Total volume of stock solution	—		—	480 c c

25 c c vials are filled with the stock solution and mixed with 5 litres of water at the place of operation *25 c c stock suspension is enough to cover 500 sq ft area*

Dosage and application It has been estimated that 1 lb of Paris green per acre will give an effective control of anopheline breeding It is dispered either by hand or by hand operated blowers when large and inaccessible areas are to be sprayed power equipment may be used or Paris green may also be applied from aircraft The suspension is sprayed over the water surface with the help of a hand operated pressure sprayer

Toxicity Paris green properly used in the field in the recommended dosage is not dangerous to human beings livestck and wild life There have been some reports of dermatitis in field workers but this can be avoided by carefully covering the body and bathing after each day work of spraying Paris green

(2) Copper arsenite

Cu (Cu OH AsO_4) and Cuprous cyanide has also been recommended for use as mosquito larvicide Their killing effect is similar to that of Paris green and are equally effective against anopheline larvae but as yet they have not been widely marketed or used

(3) Sulphur

The early insecticidal use of sulphur was largely as a fumigant in the control of flies and mosquitoes This was based on the vapourising properties of sulphur at temperatures of 20°C (68°F) which increases rapidly at higher temperatures Two lbs of sulphur should be burnt for every 1 000 cubic feet of space and the fumes should be allowed to act for 2 to 3 hours for complete disinsectisation

For agricultural pests various commercial types of sulphur are available and it is predominantly used in that field as a fungicide

(4) Phosporous

Yellow phosphorous is of regular crystalline formation with a melting point of 44.2°C (111°F) and a boiling point of 290°C (554°) The amorphous red from has a melting point of 725°C (1337°F) The latter is slightly soluble in water alcohol and ether and the former insoluble in these solvents Phosphorous is used for the control of cockroaches and the minimum lethal dose is about 0 02 mg per gm body weight of the nymph Phosphorous is also a common ingredient of rat baits

(5) Mineral Oils

Mineral oils derived from petroleum have long been known as efficient insecticides and their use has steadily increased during the last 50 years Efforts were made to standardise

the various fractions of oils and one of the most important of specifications is what is known as the "sulphonation test" Sulphonation of oils has made it possible to use the refined oils on vegetation without any ill effect

Petroleum and its derivatives are toxic to insects to a marked degree and are classed among the important insecticides

Distillates of petroleum are so varied in character that it is possible to choose suitable fractions of oils for specific purposes The lighter and more volatile distillates such as benzene and gasoline have been found useful for the control of household pests Crude oils have been used as mosquito larvicides

Petroleum is a physical mixture of a large number of organic compounds known as hydrocarbons The crude oil is broken up by distillation into a large number of fractions. The lighter fractions such as benzene, naphtha and gasoline are followed by kerosene and then light lubricating oils Special characteristics such as density unsulphonated residue viscosity oxidation volatility, acidity and sulphur contents are considered for each one of these fractions

The inherent toxic value of petroleum may be increased by the addition of other insecticides such as nicotine, rotenone, pyrethrum extract or any other synthetic organic compound

The value of mineral oils in sprays is not because of their insecticidal properties but due to a number of physical qualities which help in the distribution of the insecticides incorporated in the sprays The low surface tension of the oils increases the wetting and spreading ability and thus gives a better coverage The penetrating power of oils is greatly superior to other formulations and oil sprays are able to penetrate the minute breathing tubes of the insects.

Mosquito larvicides The use of mineral oil for the control of mosquito larvae and pupae has been known for many years Oils both suffocate and poison the aquatic stages of insects The best fractions of oils for anti larval work are those of medium boiling range not volatile enough to be markedly viscous and not too volatile to be immediately irritating to the larvae These qualities prevent the larvae for collapsing their tracheae so that they receive a lethal dose. The specifications recommended are —

Specific gravity between ...	...	27 to 38 API
Viscosity between ...	...	31 & 43 Seconds Saybolt
Initial boiling point between	...	165 to 230°C.
Final boiling point maximum	...	427°C
Spreading co efficient ...	...	17 0 dynes 1 Cm

Oils may be sprayed on the breeding places from small containers or by means of a hand sprayer When large and inaccessible areas are to be sprayed power equipment may be used Aircraft has also been used for the application of oils to extensive areas or when flood conditions require emergency treatment For larvicidal purposes various organic insecticides are now incorporated in the oily sprays

3. Insecticides of Vegetable Origin

(1) Pyrethrum

Principal among these is pyrethrum derived from a plant belonging to the genus Chrysanthemum of the family Compositae Pyrethrum flowers are somewhat similar to the common daisy It is grown chiefly in Japan Dalmatia Yugoslavia Italy Kenya and other countries round the Mediterranean sea.

The flower heads of the following species are known to be toxic to insects

(a) *P roseum* (b) *P carcum* and (c) *P cinerariae folium* The last species possesses high insecticidal properties and larger yield of flowers and is therefore cultivated widely Commerce in these flowers originated in certain provinces of Persia and Dalmatia under the various names of Persian powder Dalmatian powder as simply 'Insect powder' and more recently Jose sticks' from Japan Pyrethrum has been successfully cultivated in India (Kashmir and Nilgiris) and approximately 500 tons per annum is produced in this country

Chemistry Although all parts of the plant are more or less toxic to insects most of the toxic principle is contained in the flower head La Forge and his associates have demonstrated that the natural active principles of pyrethrum flowers are the four esters namely Pyrethrin 1 cinerin 1 Pyrethrin 2 and cinerin 2 These are formed from chrysanthemum monocarboxylic and chrysanthemum dicarboxylic acids, and the alcohols pyrethrolone and cinerolone

Allyl homologue of cinerin I, has been successfully synthesized in the laboratory and the so called synthetic pyrethrum may be commercially available in due course

practically insoluble in water
alchohol, acetone, ether and
ry from 0 3 to 1.2 per cent,
e nature of the soil, climatic
principal of the flowers will
usually prepared from flowers

erosene or any other solvent
or some other mineral oil
ent concentrated extracts are

For spraying purposes, the extract is diluted so as to contain approximately 0 1 per cent pyrethrins The expense on sprays can be such reduced by using pyrethrum emulsions instead of the usual pyrethrum kerosene solution

Emulsions

An oil soap emulsion may be made as follows Two parts (by volume) of pyrethrum extract are mixed with 2 parts of groundnutoil (it is possible that other vegetable oils would be equally suitable) The mixture is gradually added to one part of 20% soap solution (prepared by adding 2½ lb neutral soap, without any free alkali to 1 gallon of water), thoroughly agitating all the time to produce a uniform stock emulsion This emulsion concentrate retains its full efficacy for about two months after which it gradually deteriorates The spray prepared with water loses about 50% of its potency in 24 hours and should therefore be prepared daily A number of emulsifiers have been developed which prevent deteriora

central nervous system of the
the slow action of other recent

the control of malaria The

Spraying

rationale of this method is that a mosquito after taking an effective blood feed is able to

it is necessary

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room should be closed at the time of spraying and should remain closed for 20 minutes thereafter The spray is generally directed upwards and in a closed room ¼ oz of spray solution is sufficient for one thousand c ft space But when spraying in structures which cannot be completely closed, double the quantity should be used. For small rooms, hand operated atomisers of various types are used but electric or petrol power driven portable spray machines have been found more suitable for large barracks and buildings

Pyrethrum extract may also be applied in the form of a very finely atomized aerosol
atomiza
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thout any
prays but

st of the

components of pine oil particularly glycol ether of pinine have been used in fly sprays Similarly N Iso butyl undecyleneamide has been found to increase the toxicity of pyrethrins

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Emulsions

An oil soap en l on ma be made as follo s T o parts (h ol me) f o ethe n

thoroughly agitating all the time to produce a uniform stock emulsion This emulsion concentrate retains its full efficacy for about two months after which it gradually deteriorates The spray prepared with water loses about 50% of its potency in 24 hours and should therefore be prepared daily A number of emulsifiers have been developed which prevent deterioration of the pyrethrins

The pyrethrins are contact poisons and paralyse the central nervous system of the insects They have a quick knock down effect in contrast to the slow action of other recent synthetic organic insecticides

Spraying

Pyrethrum sprays have been successfully used for the control of malaria The rationale of this method is that a mosquito after taking an effective blood feed is able to transmit malaria only after 10-12 days and if the mosquitoe could be destroyed within this period, transmission of malaria woul
the mosquito rests in dark rooms
atomising the insecticides in these r
proportionate to the frequency with
passes most of its day inside rooms and cattle sheds and the infection rate among the mosquitoes is also low good results are obtained by spraying once a week. In highly malarious areas however, where the infection rate among the local mosquitoes is high
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opening into the
d for 20 minutes
m ½ oz of spray
structures which
nall rooms hand
operated atomisers of various types are used but electric or petrol power driven portable spray machines have been found more suitable for large barracks and buildings

Pyrethrum extract may also be applied in the form of a very finely atomized aerosol dispersed by special aerosol bombs These dispersers are of various sizes and the atomization is achieved eitherr by Freon Carbon Dioxide or Arcton gas The bombs are useful for the disinsectisation of aircraft, tents and railway compartments etc

Pyrethrum sprays are not toxic to man and live stock and can be used without any eleborate precautions A slight fire danger may exist in the use of kerosene sprays but in practice no such disaster has been reported

Pyrethrum sprays have been successfully employed for the control of most of the other insects affecting man and spraying technique is the same as discussed above

Synergists f
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hexanone and
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Similarly N Iso

Other similar compounds are —N Iso butyl piperonylamide N butyl piperonlamide and N, N diethyl piperonylamide

Combination of pyrethrum and DDT or other organic insecticides is used in order to obtain a quick knockdown and lethal effect The formulation contains 3 oz of Pio 05 oz of DDT in 97 oz of kerosene giving a concentration of 0 03% pyrethrins and 0 5% DDT in the spray

(2) Nicotine

(C_{10} H_{14} N_2) is the principal alkaloid found in tobacco plant which in its pure form is an almost colourless and odourless oily liquid of 1 0093 API density and boiling point of 246°C It is readily soluble in water and *to a lesser extent in mineral oil fractions*

The alkaloid is present in all parts of the tobacco plant varying in amounts from fraction of 1 per cent to 4 or 5 per cent *Commercial preparations are commonly marketed* as nicotine sulphate The sulphate form is non volatile and is less toxic than the alkaloid itself It is therefore safer to handle

Alkaline water is used as a carrier for the nicotine sprays in order to neutralize the free acid Oil sprays of nicotine or emulsions are also used The principal use of nicotine is against agricultural *pests and may be used in combination with Pyrethrum sprays in* the Public Health field

(3) Rotenone and Rotenoids

C_{23} H_{22} O_6 are active toxic principles of the Derris *plant Derris grows principally* in the Far East Eighty or more species are known but only two *Derris elliptica* and *Derris malaccensis* from Malaya are cultivated The roots are dug when the plant is about two years old at a time of the year when the Rotenone content is highest

Rotenone is a white crystalline substance with a melting point of 163°C Crystalline *Rotenone is stable but in certain organic solvents breaks down after a varying length of* time particularly on exposure to sun light and ultra violet radiation

Rotenone and its related compounds act as both contact and stomach poisons but not as fumigants Applications are made as dusts sprays aerosols etc Dust mixtures are compounded with an inert base as in the case of Paris green Liquid sprays may be prepared by making suspension of the powdered roots or by making an aqueous extract or as a colloidal suspension

Rotenone and Rotenoides were used to supplement the limited supply of Nicotine and Pyrethrum The former is effective against fleas lice flies and a number of insect larvae With the discovery of DDT and other synthetic organic insecticides however the retonones have been replaced and its use in the Public Health field is very restricted

4. Synthetic insecticides

Inorganic chemicals such as arsenic and sulphur were used for insecticidal purposes for quite a long time and practically no attention was given to the organic compounds But gradually as pyrehtrum and nicotine sprays were developed the chemists started to *synthesise organic* compounds As a result DDT and a host of other chemicals have now been *discovered*

In contrast to the inorganic insecticides organic compounds have proved more effective and some possess the added advantage of being toxic for a number of days weeks, or even months after application on insect resting places *This residual toxicity of synthetic insecticides when applied to insect resting places, is the most significant property that marks them out as unique insecticides* But most of these organic compounds including DDT, are by no means toxic to all insects Experience has shown that they are decidedly valu able for the control of certain types of insects *while ineffective against others*

(1) D. D. T.

DDT was synthesised by Seidler in 1874 but was not heard of again until 1936 37 when Geigy *Insecticides Limited in Switzerland* demonstrated its insecticidal powers and used it successfully to control Colorado beetle

It is a white creamy coloured crystalline powder possessing a fruit like odour unaffected by sunlight and water Its melting point is 108°C and its solubility in water is less than 0 2 parts per million It is moderately soluble in petroleum and vegetable oil and readily

soluble in many organic solvents such as xylene, toluen, benzene, etc The solubility of DDT in various organic solvents is as follows —

Solubility

Cyclo hexanone	100 to 120
Benzene	77 to 83
Trichlorethylene	72 to 83
O dichlorbenzene	63 to 71
Solvent naphtha	60 to 73
Xylene	56 to 62
Acetone	50 to 55
Benzyl benzoate	39 to 41
Amyl acetate	39 to 41
Dimethyl phthalate	31 to 33
Dibutyl phthalate	31 to 33
Indalone	29 to 31
Ether	27 to 28
Ethylene glycol monethyl ether	17 to 18
Pine oil	15
Sesame oil	10
Fuel Oil No 2 (Standard)	10
Cotton seed oil	9
Kerosene (crude)	8
Fuel oil No 1 (Gulf)	8
Oleic acid	8
Castor oil	7
Kerosene (refined colourless)	4
Ethyl alcohol (95 per cent)	1 5
Propylene glycol	less than 1 5
Turpentine oil (vegetable)	228 to 372
Medium Kerosene extract (aromax)*	310 to 420

Pure pp′—DDT is a fairly stable compound It does not volatilize or decompose … partial deteriora … when in solution … ed on a number … form should be discouraged

DDT is prepared from chloral alcoholate by condensation with monocholorbenzene in the presence of sulphuric acid

Mode of Action DDT is primarily a contact poison acting on the nervous system of insects and causing paralysis of the legs and wings inco-ordination of movement convulsion and finally death It is also a stomach poison Unlike pyrethrum it has a slow knock down effect, often taking several hours to kill It has no repellent action, so that insects in undiminished numbers may continue to enter a room which has been treated. They may however, become excited by contact with surfaces on which DDT has been sprayed and may eventually fly out of the room in an attempt to escape Under such circumstances it may be impossible to find dead insects in the room although majority of those originally present received a lethal dose (though some doubt has been expressed whether or not the insects receive a lethal dose and eventually die) Of course the time necessary for the insects to remain on a treated surface in order to obtain a lethal dose (for a few minutes to 2 hours or even longer) varies with different insects and depends on the concentration of DDT on the surface and the period which has elapsed since it was applied Mosquitoes can aparently survive a considerably longer period of exposure than flies

Formulation

DDT may be applied in a variety of ways, the manner of application depending upon conditions under which it is to be used and against what insects it is intended DDT is supplied commercially in a number of standard forms, although from pure 100 per cent technical grade DDT some of the formulations detailed below can be easily prepared in the laboratory

*Medium kerosene extract (aromax) is light brownish in colour and is a fraction of kerosene containing a high percentage of aromatics The higher solubility of DDT in III grade kerosene as compared with that in II grade more or less (colourless) may be due to the higher aromatic contents of the former

1. Dry powder mixed with an inert diluent such as talc, china clay or French chalk.
2. As a suspension of fine DDT crystals in water
3. Water wettable powder
4. Solution in kerosene, diesel oil fuel oil, used engine oil or malariol
5. As a solution in combination with other organic insecticides for synergistic effects.
6. Emulsion concentrate in a special solvent, with high degree of solubility such as toluene, xylol turpentine or aromax
7. As an 'Aerosol spary

Preparation of DDT dusts The waxy nature of DDT makes it difficult to grind it to the desirable small particle size *Dry powder,* however, can be prepared by mixing 10 parts of technical grade DDT with 90 parts of any of the inert diluents such as talc, pyrophylite soap stone powder, etc., and thoroughly mixed in a mechanical mixer

(2) Analogues of D. D. T.

For preparing a water suspension a wetting agent is incorporated in the mixture. Five grammes (1/6 oz) of flake gelatine and 10 grammes (1/3 oz) of powdered gum acacia is dissolved in 480 c c of hot water The solution after cooling is poured into a stone *mortar with 600 grammes (1 1/3 lb) of DDT* powder and *is* ground into a fine homogeneous paste.* Colloidal suspensions of DDT have been prepared using a 10 per cent concentrate of DDT in suitable solvents such as cellosolve and 10 per cent surface active agent such as Triton X100 Wetting and sticking egents include, soap-water at 1% of DDT, fish flue, 1 oz dissolved in one pint of water, soyabean flour and a number of other proprietory compounds

In suspensions particles of DDT tend to settle to the bottom the containers should therefore be agitated occasionally during the spraying operations

Wettable powders Water wettable powders are preferred to other types of DDT preparations, because of the storing and transport facilities and comparatively lower cost. Various commercial preparations are available but it has been experienced that only few come up to the standard specifications laid down for these powders Water wettable powders of good quality should easily mix with water and should remain suspended in water for at least half an hour, the particle size should be more than 40 μ, and should not cake up after 24 hours.

Fifty per cent water wettable powder can be locally prepared by grinding 5 per cent of *dry soap powder (tomco or sunlight) with 45 parts of soap-stone powder (pure) to* a fine consistency DDT is then added and the pulverisation continued for another 3 4 hours This powder does not conform to the above specifications but compares favourably with some of the commercial products

DDT oil solutions Solution of DDT up to 5 per cent concentration may be made with refined kerosene or 7 to 8 per cent by using refined fractions For oily solution 8 oz of DDT is dissolved in 1 gallon of oil (kerosene 3rd quality fuel oil diesel oil, used engine oil or malariol) The mixture should be stirred at intervals to ensure proper solution. The process takes 24 hours or longer but it may be hastened by placing the containers in the sun. When used for larval control, some spreader such as Turkey red oil (0 25 per cent) or rosin or oleorosin is added to the solution to obtain greater spreading coefficient.

DDT oil sprays with Pyrethrum 8 oz. of DDT is dissolved in 10 gallons of kerosene to which 3 lbs of pyrethrum extract containing 1 per cent pyrethrins has been added beforehand. DDT can also be used in combination with other synthetic insecticides such as Chlordane or methoxychlor in the ratio of 1 1 for greater synergist effects

Emulsions Emulsions may be made from concentrated solution of DDT in a solvent and diluted with water to the desired strength A number of satisfactory emulsions are being used in different parts of the world and those used in India are prepared as follows —

DDT is dissolved in toluene turpentine or aromax so as to make a near saturated solution (45 per cent in toluene, 30 per cent in toluene and turpentine mixture or in aromax)

---

*In a stone martal 10"×5" (and stone pestle) it takes about half an hour to grind half a pound of DDT With a hand-operated steel ball about 8 lbs of DDT may be ground in the same time If
the paste so formed will contain abo[illegible]
easily diluted with water To obtain
times while to make weaker suspensi[illegible]

[illegible]

treated surfaces for longer period Ten per cent gum resin or gum acacia may be mixed with Aromax DDT emulsion for similar effects

[illegible]

solvent Low pressure aerosol bombs incorporating arcton in place of freon are also being manufactured DDT can be volatilized by heat, and this principle has been made use of by various commercial concerns to produce 'DDT diffusers which can be attached to lamp shades so that DDT vapours are given off by the heat of the electric bulb

	For 2 5 per cent emulsion	For 1 25 per cent emulsion
*(i) 45 per cent solution in toulene	1 gallon	1 gallon
20 per cent soap solution	1 lb	1 lb
Water	17 gallons	23 gallons
(ii) 30 per cent solution ½ toluene ½ turpentine mixture	1 gallon	1 gallon
20 per cent soap solution	1 lb	1 lb
Water	11 gallons	23 gallons
(iii) 30 per cent solution in Aromax	1 gallon	1 gallon
20 per cent soap solution	1 lb	1 lb
Water	11 gallons	11 gallons

D D T is the most publicised and in many ways the most effective insecticide Its toxicity has been established against mosquitoes house flies bed bugs fleas and lice One or two applications during the transmission season have been found to be effective in the control of malaria in many parts of the world The cost of such applications has been calculated to be about 8 0 annas per capita per annum in India including the cost of labour, material and expert supervision Malaria control by DDT is the most effective comparatively simple and an economical method

Cumulative effect

The use of DDT, however, is not without limitations the most important being its [illegible] ivolved if adequate precau [illegible] ually absorbed in fact with [illegible] ilk of cattle sprayed with [illegible] Nevertheless it is generally [illegible] exposure to field spraying [illegible] sibility of food contamina- [illegible] must be carefully avoided

Mortality among birds and fish has been reported from heavier applications of DDT in forests and streams but apparently satisfactory control of insects is possible with adequate dosages not harmful to wild life

D. D. T. applications against mosquitoes

For indoors residual effect DDT is applied as oily solutions or watery solutions or [illegible] applied at the rate of 1 4 c c [illegible] er 1,000 sq ft In the case of [illegible] centrate with water to contain [illegible] 4 c c per sq feet respectively [illegible] average inferial quarter or a village hut

(10 x 10 x 10 ft) surface area of four walls and ceiling (500 square feet) about 20 oz or 1 pint of 5 per cent spray containing about 1oz by weight of DDT are required. Thus 1 lb of DDT will suffice for one treatment of 16 quarters and *1 ton for approximately* 36000 such quarters

When dealing with a mosquito resting in cattle sheds as well as human dwellings the former should also be treated in the same manner

Frequency of spraying The number of applications of DDT is determined by prevailing local conditions such as climatic conditions habits of the people types of surfaces the habits of the local species of mosquitoes and duration of the transmission season In some parts of India 2 3 applications of DDT during the malaria transmission season have given satisfactory results with an average dose of 50 to 60 mgm DDT *per sq ft It may be* economical to apply higher dosage of 100-200 mgs of DDT per sq ft for prolonged residual effect under favourable conditions A standard dosage has yet to be evolved

For outdoor spraying DDT is applied as 5 per cent oily solution or watery emulsion *at the rate of 1 to 2 gallons per acre*

For barrier spraying the entire surface of the ground and all likely resting places ... rards around should be sprayed. ... way to and from the breeding ... or resting places near human ... ay be found more useful for the protection of advancing troops in time of war

For indoor space spray (for spray killing) DDT is usually combined with pyrethrum for immediate knock down effect of the latter and the solution is sprayed at the rate of ¼ oz per thousand cubic feet free air space The spray recommended contains 0 5 per cent DDT with 0 03 per cent pyrethrins in kerosene

Spraying apparatus Stirrup pump shoulder pressure sprayer or knapsack sprayer may be used *Stirrup pump with a specially adapted nozzle has been found very satisfactory* Nozzle orifice should be about 1 32 1/64 inch in diameter and should be held about 1 foot to 18 inches from the surface to be treated. A fine gauze should be inserted behind the nozzle and the stopcock, to prevent coarse particles from clogging the nozzle

Against mosquito larvae 10 per cent dusts for use as *mosquito larvicides have been* prepared by thoroughly mixing DDT with stearic acid and metallic stearates (solid substances) as proprietary products and such mixtures can also be dissolved in an oily solvent for use as spray Great care is needed for dusting an area to ensure adequate dispersion along with favourable wind DDT ... 1 2 quarts per acre of water ... vegetation is so dense it may ... experienced in the use of ma ... be avoided and in the beginn ... per cent DDT It is more economical to use 1 per cent DDT emulsion at the rate of 2 gallons per acre and this has been found to be as effective as *oil solution These dosages* neither destroy the eggs nor the pupae of mosquitoes

The use of DDT against other insects House flies 5 per cent solution of DDT ... walls of ... *flies for* ... Muslin ... d places ... congre- ... building ... *esistence* to DDT and ... al spray Under such circumstances other organic insecticides such as benzene hexachloride and chlordane may be used separately or in combination with DDT

Body Lice Two methods of DDT application against lice have been developed — (a) local application of dust or liquids and (b) impregnation of clothings 10 per cent concentration of DDT in talc or pyrophylite have been found most useful for the treatment of body Lice *Pediculus humanus corporis* The head louse *P humanus capitis* may also be treated with 10 per cent powder, although better results are obtained with liquid preparations

The formula consists of benzyl benzoate 68 per cent, DDT, 6 per cent benzocaine (ovicide) 12 per cent and an organic emulsifier (Tween 80) This should be diluted with 1 to 5 parts of water before applying

Impregnation of clothing as a protection against lice however is more satisfactory

per cent of organic emulsifier

with water to contain 1 to 2

ion and dried The treatment

ommended for body lice have

cent solution or emulsion of

as been recommended

or emulsion of DDT sprayed

a deposit of at least 100 mgm

Periplaneta Americana and the

DDT powder The German

llowing precautions should be observed —

Precautions

(a) It is not essential for the operator to use a mask although for indoor work a petrol driven sprayer it is advisable to wear goggles and tie a piece of muslin to protect the face and avoid irritation

(b) Continuous contact with an oily solution of DDT is said to be harmful and therefore the wearing of clothes soaked with this over long period should be avoided

(c) Neither solutions emulsions suspensions nor dusts containing DDT should be sprayed over food stuffs

(2) Analogues of DDT

A great deal of experimental work has been in progress with a view to producing substitutes for DDT Efforts were at first mainly directed to alter the DDT molecule This has been done either by changing the number of chlorine atoms present in the DDT molecule or by substituting other chemical groups such as Flouro Bromo or Methoxy TDE or DDT is an example of the former and DFDT and DMDT are the two examples of the latter group

This compound marketed as Rhothan D 2 is the component of the active principle closely related to DDT but has proved less effective against insects affecting man It,

against mosquitoes

apid paralytic action

It is reported to be much less toxic than DDT to higher animals and for this reason it seems worthy of consideration for use under circumstances where DDT cannot be employed because of possible toxic hazard

Synergists for DDT

possess synergistic properties when incor

to p benzoquinone and benzil Combined

BHC DDT and chlordane and DDT and

ffective against houseflies and mosquitoes

than an equivalent doze of any of these insecticides Researches on immature stages of mosquitoes have however shown that there is no synergistic effect when the insecticides are mixed together in such a manner and dispersed over the water surface

(3) Benzene-hexa chloride (BHC)

BHC

Benzene hexa chloride (B H C) or more

is commercially marketted as 66 or Gammexa

a presistent musty odour It consists of a m

composition differ from each other in the ar

the five isomers—alpha beta gamma, del

recognized as being the most active constituent The melting point of these isomers are as follows —

Alpha	—	—	157 5—158 5°C
Beta	—	—	309 °C
Gamma	—	—	112 5°C
Delta	—	—	138 —139°C
Epsilon	—	—	218.5—219 3°C

Associated with these isomers there may be certain impurities such as benzene heptachloride, benzene octachloride, and *other benzene derivatives* which may contribute to variations in odour of the technical product.

Pure gamma isomer is now in large scale commercial production and is being marketed *in different formulations*. A coined name 'Lindane' has been given to the gamma isomer of a purity of not less than 99 per cent.

Benzene hexachloride being more volatile than DDT possesses *a shorter residual action* like DDT. It is unstable in the presence of alcoholic alkali.

The patent name 'Gammexane' is held by the Imperial Chemical Industries London, who have done *most of the developmental work with this* product and have marketed various formulations such as dusts, water wettable powders and emulsions of this insecticide. Gammexane P520 is the most useful formulation for Public Health purposes. It is a wettable powder containing 6.5 per cent of the gamma isomer and makes a homogenous suspension when mixed with water.

formulations is between 1/3 to 2/3 oz of Gamma isomer per 1 000 sq ft.

Benzene hexachloride is toxic to most insects but is especially promising for use against houseflies both adult and larva, ticks, and lice. BHC is coming into use more and more for the control of malaria.

(4) Chlodane

C10H 608 is known as "Velsicol 1068' or 'Octoklor'. It is a colourless odourless liquid with a boiling point of 175°C and occasionally shows a tendency to crystallise. It is *soluble in organic solvents*

as in most ketones, ether ar

oil. It is not soluble in wat

Chlordane may be forr

dust.

It exhibits a wide range of effectiveness against various groups of insects and is superior to DDT for controlling certain species of cockroaches, ticks and mites.

It is similar to DDT as a mosquito larvicide, but is particularly active against the houseflies and cockroaches. The minimum effective dosage against several insects is either lower than or close to that of DDT. Against houseflies chlordane effective for 9 24 weeks respectively.

Laboratory tests against body lice have shown that chlordane not only has a lower minimum toxic concentration than DDT, but its effect persists longer when impregnated into clothing. Chlordane is less resistant to laundering than DDT.

(5) Toxaphene

A complex chlorinated hydrocarbon related to chlordane and having the empirical formula C10 H5 C17 has been developed possessing good insecticidal properties.

Toxaphene (Chlorinated Camphene) C10 H10 O18 an insecticide containing chlorinated camphene designated by the manufacturers as 'Hercules 3956' is prepared by chlorinating a bicyclic terpene, e.g. camphene to such an extent that the final product contains about 65 per cent chlorine. *It appears to be more effective than DDT against body lice* but less effective against adult mosquitoes, mosquito larvae and houseflies. It is also effective *against Chiggers* and ticks.

It is similar to DDT in being slow in action and is considerably less effective than DDT as a space spray.

Further studies on the toxicology of this insecticide formulations and extensive field tests against the particular insect pest to be controlled will be required before definite recommendations can be made for the practical use of this material.

Compared with *DDT relatively little is known of the toxicity* of these compounds to higher forms of life but indications are that Toxaphene is about four times as toxic as DDT.

(6) Aldrin. Dieldrin

Aldrin (118)

C12 H8 O16 is a coined name *for an insecticide* with a chemical formula 1 2 3 4, 10 Hexachloro 1, 4, 4a 5 8 8a Hexahydro—1, 4 5 8-diamethanon aphathalene. It is a white

crystalline solid with a melting point of 100 to 103°C. It is highly soluble in most organic solvents but is insoluble in water It is stable in the presence of organic and inorganic alkalies and is also stable to the action of hydrated metallic chlorides

Julius Hyman Co., have secured the trade mark registration of Octalane for insecticide use of the materials

Form... ettable powder, as an emulsion

ultural pests in general, but and mosquitoes The range of effective dilution against mosquito larvae is from 1 to 5 200 millions Against housefly maggots as l ttle as 1 or two parts per million in media has totally prevented adult emergence

It is highly toxic to warm blooded animals and insecticidal formulations containing aldrin should therefore be handled with extreme care. It is most important that contaminated clothing or contaminated skin be washed to avoid continued contact with the skin Wearing of respirators should be encouraged.

Dieldrin (497)

C_{12} H_8 C_{16} is a coined name for an insecticidal product containing 1 2 3 4, 10-Hexachloro—6 7 Epoxy—1, 4, 4a 5 6 7 8, 8a—Octahydro—1 4, 5 8—

moderately petroleum s insoluble in water

Julius and Hyman & Co have trade mark registration of "Octalox for insecticidal use of the material.

Form emulsifiable concentrate as a xylene is compound makes it easy to formul equipment Concentration above 50° nd insects of Public

is been found highly A layer deposited at this dose has been found to rema n effective for 4 to 12 weeks following application

As a fly and mosquito larvicide 497 has been found to be equally effective Dilution of 1 part per million in larval breed ng media completely prevents the emergence of adult flies (although some maggots may pupate) Along with residual spraying for the control of houseflies all suspencted breeding areas should also be treated For mosquito larvae, 497 has been found to be effective against many species lethal concentrations ranging from 1 part in 100-300 million parts of water 497 is also more effective against pupae of mosquitoes than DDT or chlordane This indicates that for the control of mosquito larvae under fixed cond tions, dosages ranging from one half to one fourth of those normally recommended for DDT will be effective

Like Aldrine Dieldrin is toxic to higher animals and therefore this insecticide should be handled with extreme care

(7) Phosphate series

The organic esters of phosphoric acid were developed in Germany by Schrader and his co workers who have described the remarkable biological properties of certain of these compounds.

Hexaethyl ... and Diethyl th and the last or *extensively tne* importance

Hexaeth l tet ...

... absence of moisture it is stable at room temperatures but hydrolyses in aqueous solutions

Another form develop
This is a colourless liqui
pressure It is soluble in
in petroleum fractions It
active for longer periods It possesses some fumigant action

Still another phsophate compound O O diethyl O pnitrophhenyl thiophosphate known as 'Thiophos 3422' more commonly known as Parathion is the most publicised of the phosphate series of insecticides and has been tested against a variety of agricultural pests with very favourable results

5. Special indications for the control of various insects

Places of mosquitoes

Many species have selective sheltering places and therefore through investigation should be made to ascertain those resting places of the insects Much of the success of the operation will depend upon this factor

1 *Mosquitoes* Liquid preparations of insecticides should be applied to the resting

2 *Flies* The same treatment is effective against flies but at the same time the insecticide
they pick 1
there is the

3 *Sandflies* Interior walls of dwelling places should be treated as above and also the breeding places such as cracked stone walls etc

4 *Fleas* DDT powder 5 to 10 per cent should be dusted on the floors of the infested house in rat holes and special attention should be paid to dust the inter spaces between bagges in godown and stores which are the favourite haunts of the infested rodents The houses may also be sprayed with liquid solutions as in the case of adult mosquitoes and such treatment has been reported to reduce the flea population appreciably

5 *Lice* Liquid preparations should not be sprayed on the flooring 5 or 10 per cent powder should be thoroughly dusted on the clothings either by hand or by means of a small hand dust gun and about 2 oz of mixture per individual should suffice

6 *Tikes* DDT is not effective against ticks and therefore Gammaxene or any other organic insecticide should be tried 8 ounces of crude benzene hexachloride (1 oz of active gamma isomer) should be applied to every hundred sq feet of floor surface and the applications should be repeated at intervals of 4 weeks till all ticks are killed When other preparations are used the active gamma isomer should be taken into account in estimating dosages

7 *Bed bugs* All cracks in the walls floors ceiling and furniture should be treated with liberal doses of DDT in liquid form Dosage recommended are the same as above (200 mg per sq ft) but should be repeated a day or two later to ensure that an effective residual deposit is left

8 *Cockroaches* The most effective treatment is the laying down of powdered DDT 5 or 10 per cent mixture in places favoured by these vermins but liquid preparations on the walls and floors will also greatly reduce their numbers

6. R...

few
mosquitoes and other ...
of pyrethrum used in the form of vanishing cream with a stearic acid ... be a more effective repellent

But all these preparations gave inadequate protection and had either an objectionable greasiness or were uncomfortable to use especially under the tropical conditions

The search for new and more efficient repellent during the last war resulted in the preparation of 7000 organic chemicals of which 50 were found to be superior to the older repellent containing aromatic oils or pyrethrum extract

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* Bamber oil (oil of Citronella 1½ parts liquid paraffin 1 part cocoanut oil 2 parts carbolic acid 1 part)

**Dovers cream (oil of Citronella ½ oz spirits of Camphor ½ oz Cedarwood oil ½ oz white petroleum jelly 2 oz) or semi solid preparations of citronella in a paraffin base

‡ Extract of pyrethrum (2%) 10 parts ground nut oil 10 parts stearic acid 15 parts Caustic soda 0 5 parts oil of Citronella 4 parts gum tragacanth powder 0 5 parts and water 49 5 parts

The most effective preparations found were —

Indalone
Dimethyl phthalate (DMP)
Dibutyl phthalate
Dimethyl carbate
Rutger 612
Benzyl benzoate

Preparations

DMP is most suitable for mosquitoes in general and dimethyl carbate and Rutger 612 for pests mosquitoes of the Aedes group The most satisfactory mixture for general use is a mixture of various repellents and is composed of 6 parts dimethyl phthalate 2 part Rutger 612 and 2 parts Indalone Smeared as a thin layer over the exposed part this mixture gives protection for about 3 4 hours

Dibutyl phthalate is as effective a repellent, but is not so readily removed on washing or sweating

Benzyl Benzoate has also been found to be effective for Chiggers resistant to laundering is more economical and readily available

Benzyl benzoate and 2 phenyl cyclohexanol have been found more effective for clothing treatment against fleas than have dimethyl phthalate 'Indalone' and 'Rutger 612'

DMP is the most preferred repellent because of its long duration of effect, availability and low cost

Insect repellent should be applied in a uniform film on hands face arms, or other exposed parts which are liable to be bitten They should be applied liberally and should be reapplied as often as necessary Certain persons are protected for a much longer time than others by the same preparation So that it is impossible to state definitely the exact period of protection obtainable in any particular case in general it may be assumed that no repellent will be completely effective for more than two hours and partially protective for 6 hours The same procedure may be used for applying the repellents to clothing such as socks shirts or trousers through which insects may bite

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PART VII

DISEASES OF THE BIOOD

PHYSIOLOGY OF RED CELL FORMATION—NORMAL BLOOD VALUES—CLASSIFICATION OF ANÆMIAS ANÆMIA FOLLOWING ACUTE HÆMORRHAGE, ANÆMIA FOLLOWING CHRONIC HAEMORRHAGE—DYSHAEMOPOIETIC ANÆMIAS MACROCYTIC TYPE PERNICIOUS ANÆMIA TROPICAL NUTRITIONAL ANÆMIA, MEGALOBLASTIC ANÆMIA OF SPRUE MICROCYTIC TYPE IDIOPATHIC HYPOCHROMIC ANÆMIA OF SIMPLE IRON DEFICIENCY HAEMOLYTIC ANÆMIAS—ACHOLURIC JAUNDICE.

THE ANAEMIAS

The terms anæmia signifies a reduction in the hæmoglobin content of the circulating blood The normal average concentration of hæmoglobin in the circulating blood is generally taken as 15 grams per 100 ccm and any significant reduction in this val
of the blood may be
in the hæmoglobin c
tion of both these factors

1. *Physiology of red cell formation*

The red blood cells and their precursors which are together termed the erythroblastic series originate from the reticulo endothelial system situated *principally in the bone marrow From the reticulo endothelial cells* the normal red blood cells develop by a process of karyokinetic division and maturation through successive stages which may be studied by supra vital staining methods in smears from active bone marrow The stages of maturation may be represented in tabular form as follows —

RETICULO ENDOTHELIAL SYSTEM
↓

MEGALOBLAST ↓ By Karyokinetic division.	Size 14 to 19 microns large vesicular nucleus basic cytoplasm no hæmoglobin.
EARLY ERYTHROBLAST ↓ By Karyokinetic division	Size 12 to 16 microns nucleus smaller and denser no hæmoglobin
LATE ERYTHROBLAST ↓ Maturation	Size 10 to 14 microns nuclear material condensed into small dense nucleus hæmoglobinisation begins
NORMOBLAST ↓ Maturation nucleus extruded	Size 7 to 10 microns small dense eccentric *nucleus cytoplasm prominently reticular* hæmoglobinisation progresses to fullness.
RETICULOCYTE ↓ Maturation	Size 7 to 9 microns non nucleated cytoplasm highly reticular Normal bone marrow *contains large number of* such cells
ERYTHROCYTE	Circular elastic bi concave discs non nucleated non reticulated Average diameter 7.2 microns

-t cells) of
the fusion
ige in size
n d ameter
s

Essential Requisites in Blood formation

Certain factors are essential requisites for normal red blood cell formation, chief of these being the haemopoeitic principle or P A factor which is elaborated in the body by the interaction of an *extrinsic factor* present in high class proteins with an *intrinsic factor* present in normal gastric juice, iron, traces of copper and cobalt, Vitamin C, certain vitamins of the B complex group and thyroxin *Extrinsic & Intrinsic Fa*

Iron is essential for haemoglobin formation and whereas a considerable proportion of he requirements of the blood forming tissues are met from iron liberated as a result of destruction of red blood cells in the reticulo endothelial system, the balance of the body's requirements must be met by dietary intake It is estimated that the normal iron intake required is about 15 mgm daily In conditions where there is abnormally increased loss *Iron*

Mean Corpuscular Volume

Due to difficulty of adequate absorption and utilization, large amounts of iron have to be administered for therapeutic purposes The requisite daily dosage of some of the various iron preparations have been carefully worked out by Witts (1936) and others after extensive therapeutic trials and are given below —

Reduced iron 1 5 to 6 gm orally, ferrous sulphate exsiccated 0 6 gm orally, ferrous carbonate 3 to 4 gm orally, liquor ferri perchlor 8 ccm orally, iron and ammon cit 4 to 8 gm orally, injectio ferri B P 5 to 10 ccm parenterally

Copper Small traces of copper assist in the absorption and utilization of iron and its conversion into hæmoglobin Daily dietetic requirements are 2 to 6 mgm of copper and the average diet is generally ample in this respect. Milk, however, is poor in copper and infants on a purely milk diet may develop a deficiency Most commercial preparations of iron contain sufficient amount of copper as impurity and administration of copper separately is generally not necessary *Copper*

Arsenic has for centuries been used a haematinic and was generally incorporated into iron mixtures It is, however now sufficiently established that this drug depresses blood formation rather than stimulates it *Arsenic*

Haemopoietic Principle and Vitamin B12 Minot and Murphy (1926) first demonstrated the curative action of raw liver in pernicious anæmia and suggested that it contained a haemopoietic principle which was lacking or deficient in this disease Further work by Castle et al (1929, 1930 1931) indicated the mechanism of formation of the haemopoietic principle The diet contains an *extrinsic factor* which is present in certain high class proteins, particularly in meat and yeast Normal gastric juice contains an *intrinsic factor* *Vitamin B1*

operations of the stomach Even though it is normally formed deficiency of haemopoietic principle may be due to inadequate absorption as in certain gastro intestinal disturbances, notably Sprue, Idiopathic Steatorrhea Coeliac disease, etc Diseases of the liver, such as Cirrhosis, carcinomatosis etc may interfere with the storage of haemopoietic principle Feeding with whole liver liver extracts or highly concentrated liver extracts given by the parenteral route supply ready made haemopoeitic principle and thus affect a cure Hæmopoietic principle is also present in dessicated hog's stomach

In the absence of sufficient haemopoietic principle normal red cell formation by the bone marrow is not possible and the erythroblastic tissues undergo a megaloblastic degeneration The haemopoietic principle is necessary for the proper maturation of megaloblasts into erythroblasts and normoblasts and the red cells produced are few in number and are abnormally large in size

• In 1948, Smith in England and Rickes and co-workers in the U S A succeeded in isolating from liver a pure crystalline substance which they named vitamin B 12 and which they found could, in very minute doses, reproduce all the hæmatinic activity of liver and

is therefore of particular value in determining the progress of therapy in pernicious anæmia and the *reticulocyte response* is in fact used as the method of standardizing thepotency of liver extracts In chronic haemolytic anæmias the reticulocyte count is often h gh and in acholuric jaundice a persistent reticulocytosis is a diagnostic feature

(14) *The Icterus Index* is obtained by comparing the colour of the blood serum with that of a 1 in 10 000 solution of potassiumate dichromate and is a measure of the amount of bilirubin in the blood plasma Normal blood has an icterus index of 4 to 7 Jaundice is only evident clinically when this index rises to over 17 The icterus index is raised in acholuric jaundice pernicious anæmia and malaria and is low hypochromic anæmias

3 Classification of anaemias

The older classifications of anæmias according to size of red cells into macrocytic normocytic and microcytic is unsatisfactory It is customary now a days to classify anæmias according to their aetiological basis

(1) *Anaemia due to Acute or Chronic Blood Loss* Anaemia resulting from acute blood loss is generally met with after accidental haemmorrhage or internal haemmorrhage such as haematemesis or malaena from peptic ulcer Anæmia as a result of chronic blood loss is commonly met with in such varied conditions as peptic ulcer piles menorrhagia hook worm infestation purpuric states haemophilia etc

(2) *The Dys haematopoietic Anaemias* In this group of anaemias the essential cause is a depression or failure of the normal blood forming activity of the bone marrow Depression of the erythroblastic tissues may be caused by a deficiency in the intake or absorption of one or more of the factors necessary for blood formation The commonest deficiency is that of iron as in the common microcytic hypochromic anæmias and deficiency of haemopoietic principle as in pernicious anæmia and tropical nutritional anæmia Deficient assorption of haemopoietic principle may occur in diseases of the gastrointestinal tract, particularly in achylia gastrica carcinoma of the stomach sprue etc. Deficiencies in certain subs diary factors necessary for normal haemopioesis may occur as in defic ency of copper vitamin C some members of the vitamin B group and thyroxin Depression of the blood forming tissues occurs principally in certain infections acute and chronic such as tuberculosis and nephritis and in poisoning with benzene and some benzene derivaties sulphonamides etc

of the principle

tions of the liver due to toxins anr poi ons act by interefering with the normal storage liver such as cirrhosis obstructive jaundice carcinomatous deposits and degenerative cond

The liver is the principal store house for haemopoietic principles and diseases of the

(3) *The Haemolytic Anaemias* This is an important group of anaemias in wh ch the essential cause is an increased destruction of red blood cells due either to infective toxic or intrinsic factors In the infective group may be classified such anaemias caused by haemolytic streptococci staphylococci *Cl Welchii* malaria Oroya fever etc In the toxic group are anæmias caused by posoning with lead, phenylhydrazine sulphonamides organic arsenicals phosphorus snake venom toxins from severe burns and a number of other chemicals In the intrinsic or primary haemolytic anæmias there may be a congenital defect in the red blood cells as for example in acholuric jaundice and s ckle cell anæmia On the other hand haemolysis may occur as a result of haemolysins circulating in the body as in incompatible blood transfusions paroxysmal haemoglobinuria and erythioblastosis foetalis

(4) *The Leuco erythroblastic Anaemias* In certain diseases of bones a very characteristic anæmia frequently develops The significant factor in this group of anæmias is not the degree of anæmia itself as the characteristic appearance in the blood of large numbers of immature and nucleated red cells Common bone d seases associated with this type of anæmia are Pagets disease carc nomatosis of bone Hodgk n s disease leukaemia and multiple myelomatosis

(1) Anaemia following acute haemorrhage

Anæmia following acute and sudden loss of blood presents a very characterist c cl nical picture The blood loss may be external as in accidental injury or *internal as in haemmorrhage* from a peptic ulcer The patient is restless the sk n is cold and clammy, the pulse is rapid of small volume and low tension and the blood pressure is low Respiration is rapid and shallow and the patient feels extremely weak and prostrated Pallor may be extreme Immediately following the haemmorrhage the blood picture is normal but very soon the loss of blood volume is restored by absorption of fluid from the tissues and evidence of blood dilution and anæmia then begins to appear

Within 24 to 48 hours the picture of a hypochromic anæmia begins to emerge. The red cell count and haemoglobin are both reduced according to the degree of haemorrhage but the reduction in haemoglobin is proportionately more than the reduction in red cell

Treatment

to restore the blo

whole blood Ad

sulphate 9 grains

proteins of high biological value, is essential

(2) Chronic Post-Haemorrhagic Anaemia

of the anæmic state Chronic loss of blood from the gastro intestinal tract such as in chronic peptic ulcer haemorrhoids and hook worm infestation are amongst the commonest causes In women excessive menstrual loss and chronic uterine bleeding are common aetiological factors

Blood examination generally reveals variable decrease in the red cell count and a correspondingly more marked decrease in the haemoglobin concentration The colour index is consequently low and moderate microcytosis is generally present In severe cases there may be marked anisocytosis and poikilocytosis Reticulocytes are present but only in moderate numbers

Symptoms and signs are the same as those found in any severe anæmia. The patient generally complains of easy ... certion In severe cases dyspnoea may be con... unting may occur and œdema of the ankles ... rarely a symptom In women ammenorrhia is ...

Treatment Iron therapy as in acute haemorrhagic anæmias is the sheet anchor of treatment It is however necessary to investigate the patient carefully for any possible associated pathological condition and institute appropriate treatment Correction of dietetic errors provision of ample first class proteins and vitamins are necessary adjuncts to treatment

Anæmia associated with hook worm infestation Although severe anæmia may be associated with any helminthic infection hookworm anæmia deserves special consideration because of its widespread distribution and frequently its severe character Rao (1937) concluded that a single worm is responsible for the loss of 0 38 ccm of blood daily and that this figure may be multiplied four or five fold when the worms are very vigorous The diet is also generally poor in iron content The anæmia is generally moderate with low red cell count and ... *Hookworm Anæmia*
fall to 0 5 or
severe cases ...
cells so that
is a moderate
compensates for the anæmia.

Treatment The helminthic infestation should be promptly and adequately treated A good diet rich in iron, proteins and vitamins should be given and iron should be given in large amounts, such 15 grains daily of ferrons sulphate or 90 grains daily of iron and ammonium citrate

4. *Dyshaemopoietic Anaemias*

(1) Macrocytic Hyperchromic Type

(a) Pernicious Anaemia (Syn. Addisonian Anaemia)

The syndrome of pernicious anæmia was *first described by Addison in 1925 It generally* appears in middle age individuals and is characterized by a macrocytic anæmia achylia gastrica and other gastro intestinal symptoms and subacute combined degeneration of the spinal cord The aetiology is uncertain but it appears to be a nutritional deficiency disease caused by a deficiency of the haemopoietic principle Recent work has shown that the haemopoietic principle is identical with the recently isolated vitamin B_{12} The disease is characterized by *spontaneous remissions but if untreated progresses inevitably towards a* fatal end

Aetiology Minot and Murphy (1926) first demonstrated the curative action of raw or lightly cooked liver in pernicious anæmia and suggested that liver contained a haemopoietic principle or P A. factor Castle and Co workers (1929 1930 1931) demonstrated that normal gastric juice contains an *intrinsic factor* which reacts with an *extrinsic factor* present in beef and other high grade proteins to produce the *haemopoietic principle* which is then absorbed and stored in the liver In the absence of this principle the normal bone marrow function is disturbed and it undergoes a megaloblastic degeneration In pernicious anæmia there is a degeneration of the gastric mucosa and the stomach fails to produce not only hydrochloric acid but also the intrinsic factor When haemopoietic principle is supplied to the body either in the form of large amounts of liver or liver extracts by mouth, or refined liver extracts parenterally normal bone marrow function is resumed In 1948 Smith in England and Rickes et al in U S A reported the isolation from liver of a

us anæmia

principle

y confined

Southern

Europe and South America and is extremely rare amongst the tropical peoples There is considerable evidence that there is a familial predisposition to the disease

Blood examination In moderate cases the red cell count is reduced to between 2 and 3 million cells per cmm and the haemoglobin 6 to 9 grams per 100 cmm The colour index is above 1 and may be as high as 1 5 or even 1 8 There is a distinct macrocytosis the average red cells diameter being about 8.4 microns and anisocytosis, poikilocytosis and polychromatophilia are present Megaloblasts are apparent but in scanty numbers as are also normoblasts Reticulocytes are present to the extent of about one per cent and the blood platelets are markedly reduced There is also leucopenia with a relative lymphocytosis and the Arneth count may show a shift to the right

In a severe case the red cells may be reduced to one million or even less and the haemoglobin to 3 to 5 grams the colour index being highly generally upto 1 5 Macrocytosis is extreme the average diameter of the red cells being 9 microns or more Megaloblasts are present and normoblasts are more numerous than in moderate cases Variations in the size and shape of the red cells are more pronounced, but reticulocytes may be absent Blood platelets are further reduced e g 80 000 per cmm and lymphocytes may total as much as 75 per cent of the reduced total white cells

In cases responding to treatment *with liver extracts or vitamin B_{12} the reticulocytes* soon start increasing in number and reach their maximum between the fourth and the tenth day when they may form as much as 20 per cent of the total red cells This is known as the reticulocyte response and is the criterion of successful therapy The red cells increase slowly at first but later as the reticulocyte response fades they begin to rise rapidly The haemoglobin rise does not keep pace with the rise in red cells count and the colour index *falls to below one Megaloblasts and normoblasts soon disappear and the* red cells soon resume their normal size The leucocytes and blood platelet count is also soon restored to normal

Gastric analysis There is complete achlorhydria even after injection of histamine This achlorhydria is permanent and persists after successful treatment

Signs and symptoms The patients are usually of slightly acromegaloid facies and the skin is pale and shows a distinct lemon-coloured tint The onset of symptoms is very insidious and the commonest early complaint is one of increasing lassitude and fatigueability weakness shortness of breath headaches and dizziness Soreness of the tongue digestive disturbances palpitations numbness and tingling of the legs are other common initial symptoms In more advanced cases all the above symptoms are accentuated and dyspnoea and pulpitations may be troublesome even on slight exertion Attacks of anginal pain are not infrequent and there may be oedema of the ankles In women amenorrhea is common

Nervous signs and symptoms due to degeneration of the posterolateral columns of the spinal cord are encountered in a considerable proportion of the cases the earliest being diminution or loss of vibration sense. Later there is glove or stocking anaesthesia with shooting limb and girdle pains A spastic paraplegia with ataxia increased reflexes and an extensor plantar response may develop and this may later be followed by a flaccid paralysis with absent reflexes Sexual vigour is lost early but paralysis of the sphincters is generally a late manifestution Mental changes are not uncommon in severe cases but may be present occasionally in early cases

Treatment Rest in bed is of great value in all cases of severe anæmia and should be enforced if the hæmoglobin is below about 50 per cent Blood transfusions are dangerous in pernicious anæmia because of the frequency and severity of reactions and should only be resorted to in serious emergency A warm dry climate is helful for rapid restoration to health and chilling should be avoided The diet should be ample and varied and should contain abundant amounts of high class proteins but should be low in fat content Vitamin supplements are of value, in particular vitamin C and vitamins of the B complex

Specific therapy It has recently been established that the value of refined liver extracts in pernicious anæmia is due mainly to the vitamin B_{12} content Now that vitamin B_{12} is generally available at a very moderate cost it is advisable to administer this preparation intermuscularly Recommended dosage are 15 to 20 micrograms of crystalline vitamin B_{12} daily for one week in severe cases and on alternate days in moderate cases There after 15 to 20 micrograms are administered twice a week till the blood picture is normal For subsequent maintainance 15 to 20 micrograms intramuscularly once in every two weeks is generally adequate though periodic blood examinations are necessary for checking Ungby (1949) has recommended an initial dose of 40 to 80 micrograms followed by 20 micrograms once weekly till the blood picture is normal

A large variety of liver extracts are marketed by various manufacturers and should if it be decided to use these instead of vitamin B_{12} only preparations marketed by reputable manufacturers should be used *The most affective and cheapest method of administering liver extract is by intramuscular injection* Liver extract by the oral route is satisfactory but as very much larger quantities have to be used it is expensive The recommended dosages for intramuscular liver extracts vary widely but it is the current opinion that the manufacturers recommended dosage are generally on the low side For cases of moderate severity 6 ccm of a liver extract such as neo hepatex campolon hepastab anahaemin neo livacon etc should be given intramuscularly twice a week for the first week and 2 ccm once weekly thereafter till the normal blood picture is restored For maintenance dosage of 2 ccm every week in ten days or 6 ccm once every month are suggested *Intramuscular Route*

Folic acid The utility of folic acid in classical pernicious anæmia is limited to those cases in which there is no evidence of involvement of the nervous system Besides folic acid is very expensive in comparison to vitamin B_{12} or

liver extracts In patients with nervous involvement folic acid has a very deleterious effect on the course of the nervous manifestations and it should not be used Folic acid is equally effective by the oral or parenteral routes and therefore the former is to be preferred Suggested dosages are 10 to 15 mgm daily by mouth for curative purposes and 5 to 10 mgm daily for maintainance

(b) Tropical Nutrional Anaemia

Tropical Macrocytic anæmia Tropical Megaloblastic Anæmia Nutritional Macrocytic anæmia of Pregnancy *Aetiology* Tropical nutritional anæmia is a disease common to the tropical regions of the world and is *particularly prevalent in India. It is believed to* be due to lack of adequate amounts of extinsic factor in the diet and is cured by Yeast and Yeast extracts and crude liver extracts The response to folic acid is generally satisfactory but response to refined liver extracts and vitamin B_{12} is variable The anæmia is aggravated by pregnancy is therefore most commonly seen in its acute form in women The natural remissions that are so characteristic of pernicious anæmia do not occur in this disease

The anæmia is macrocytic in type though not always hyperchromic, and is generally severe Free hydrochloric acid is present in the gastric secretions gastro intestinal symptoms such as sore tongue, etc are often present but neurological lesions in the spinal cord are absent

The chief aetiological factor appears to be lack of sufficient proteins of high biological value in the diest and it is thus more prevalent amongst the vegetarian peoples and more particularly among those who subsist largely on rice vitamin deficiencies particularly of vitamin A and the vitamins of the B complex are common

A survey of recent literature shows that tropical nutritional anæmia a common diseases in tropical and temperate areas occurs where there is a high incidence of malaria

Napier and Majumdar (1938) found a distinct relation between the frequency of this type of anæmia and the incidence o[...] n British Columbia found that 90 per cent of his cases of [...] spleens and with few exceptions were all suffe[...] and Bopaiya (1942) reported that in the Nilgiris [...] of anæmia is rare despite the poor rice diet

Pregnancy is a strong ætological fac[...] the victim In Giglioli's series referred to above, the [...] to 1 while other investigators have reported ratios c[...] incidence in women is between the ages of 17 to 30 y[...] the disease manifests itself particularly during the la[...] tal demands put a further strain on the already starved haemopoetic system

It is clear from a large number of investigations that ankylostomiasis does not play any significant part in the production of this syndrome though heavy infestations may aggravate an existing anæmia which may then become hypochronic due to an iron deficiency

Symptoms and signs The appearance of symptoms is generally insidious common early complaints being progressive loss of energy and breathlessness The onset of the [...] after an attack of fever presumably malaria As

practically all the cases [...]

Enlargement of the spleen is found in a large percentage of the patients

Blood picture It is common for patients to seek medical aid until the anæmia has become very severe The majority of patients have red cell counts well below 2 millions by the time they attend for treatment and initial red cell counts may be 1 million or even lower The haemoglobin generally drops to 3 to 5 grams per 100 c cm the colour index being comparactively high The mean corpuscular haemoglobin value ranges from 37 to 40 micrograms and the mean corpuscular haemoglobin concentration from 28 to 33 *per cent* [...] of the red cells is decreased Blood

Treatment Yeast and yeast extracts such as marmite, crude liver extracts and folic acid all result in a rapid restoration of the blood picture to normal The response to highly refined liver extracts and vitamin B_{12} preparation is not so constant

Treatment with yeast and yeast extracts is cheap and effective In tropical countries generally and in India in particular where a large sugar industry exists large quantities of yeast are produced as a by product of the distilleries and are used as manure This yeast is rich in proteins of a high biological value and is extremely cheap, whereas liver extracts folic acid and vitamin B_{12} are very expensive Six to eight ounces of yeast daily by mouth result in rapid improvement of both the red cell count and the haemoglobin Should the regeneration of haemoglobin lay behind that of the red cells, supplemental iron therapy is indicated Marmite a autolysed yeast extract is equally effective in dosage of 15 to 30 grams daily Yeast and yeast extracts not only provide the necessary haematinic stimulant, but are also rich in vitamins of the B Complex type of which there often is a co existing deficiency

Yeast crud liver extrac folic acid

Liver preparations either by the oral or intramuscular routes are also satis factory The equivalent of at least half a pound of raw liver must be given daily and even larger doses may be necessary

Crude liver extracts are generally more potent than the more highly refined extracts In megaloblastic anæmias associated with pregnancy response to yeast, liver extracts or vitamin B_{12} may not be satisfactory and in such cases treatment with folic acid by mouth in doses of 10 mgm daily generally effects a cure

Folic acid is expensive but is usually effective in this group of anæmias Simplicity and ease of administration are factors which merit consideration It is equally effective by the oral and parenteral routes but parenteral administration is rarely necessary Effective dosage is 10 to 15 mgm daily

Vitamin B_{12} in doses of 40 to 80 micrograms initially, followed by 20 micrograms once weekly, is generally effective except in some cases associated with pregnancy

Iron therapy is indicated in cases where the colour index is found to be below one or mean corpuscular haemoglobin values below normal

(c) Megaloblastic Anaemia of Sprue

Sprue is now believed to be primarily a nutritional deficiency disease due to a deficiency of folic acid and possibly other nutritional factors The resulting disturbances of physio logical functions of the gastro intestinal tract interferes with the absorption of various food factors and also of the hæmopoietic principle

Anæmia, which commonly develops in this disease is at first microcytic and hypochromic due to deficient iron absorption but later deficiency of the haemopoietic principle becomes established the anæm[illegible]
shows th[illegible]
numbers[illegible]
are prese[illegible]
a case of[illegible]
and all the symptoms of a severe anæmia are present

Differential diagnosis from other megaloblastic anæmias is made by the characteristic combination of steatorrhea, glossitis and macrocytic anæmia

Treatment For severely ill patients it is essential to order complete rest in bed Activity of ambulant patients should be considerably restricted A high protein diet, low in fat and carbohydrate content should be ordered

Folic acid should be prescribed in doses of 10 mgm orally three times a day If response to folic acid by the oral route is not satisfactory it may be given intramuscularly in the same dosage

and thereafter twice each week till the patient is restored to normal

Vitamin deficiencies particularly of the B Complex are frequent and supplemental therapy with yeast or vitamin B Complex in tablets or capsule form is advisable Iron should be prescribed if the blood picture indicates a deficiency Ferrous sulphate in doses of 15 grains a day or iron and ammonium citrate 60 to 90 grains a day is usually necessary

Response to Vitamin B_{12} *is variable* Spies (1949) reported a few cases which responded satisfactorily but other investigators have reported failure with vitamin B_{12} in several cases, which subsequently responded effectively to folic acid

Megaloblastic Anaemia Associated with Liver Disease

In cirrhosis of the liver subacute yellow atrophy of the liver extensive secondary malignant deposits and certain types of obstructive jaundice a megaloblastic anæmia develops due to lack of proper storage of the haemopoietic principle The blood picture resembles that of pernicious anaemia in relapse

To be effective treatment with refined and highly potent liver extracts or vitamin B 12 requires to be more intensive and more frequent as the power of the liver to store these substances is lost.

(2) Microcytic Hypochromic Type

This group of anaemias is primarily due to a deficiency either in the dietary intake or failure to absorb or utilize the necessary amounts of iron required for normal haemopoiesis

(a) Idiopathic Hypochronic

Symptoms Chronic Microcytic Anæmia simple Achlorhydric Anæmia Nutritional Hypochromic Anæmia Chlorosis and Iron Deficiency Anæmia

to a deficiency in the supply of sufficient amounts of tissues whether the deficiency arises as a result of rption or utilization of the iron content of the diet *microcytic type with a low colour index and a* syndrome of hesias and Ko lonychia commonly complicates the picture

Aetiology Idiopathic hypochromic anæmia is *predominantly met with in* middle aged women in the West, but in tropical countries particularly it is also frequently encountered in males In the West the disease is rarely encountered in women below 20 years and above 50 *years of* age though in the tropics much younger women are often affected Menstruation pregnancy and lactation call for additional supply of iron which may not be complete achlorhydria which are almost leficiency The normal iron requirements daily and extensive surveys by various

The frequency of iron deficiency anæmia in women of the child bearing and middle age may thus be readily appreciated, especially when the additional aggravation caused by the poor absorption of iron as a result of hypochlorhydria or achlorhydria is taken into account Helminthic infestation of the intestinal tract may also interfere with proper ab orption of iron This group of anæmias is one of the most frequent causes of chronic invalidism in women

Signs & symptoms The onset of symptoms is generally very insidious frequently being associated with the previous pregnancy General signs and symptoms associated with severe anæmias such as pallor, dyspnoea lassitude, palpitations, precordial pain, œdema of the ankles and menorrhagia may be present Dyspepsia, which is generally worse after taking high protein foodstuffs is often present and constipation is a common complaint

Plummer Syndrome

In a small percentage of cases the syndrome of Plummer-Vinson comprising redness and soreness of the tongue and dysphagia referred to the post cricoid region, may be present in addition The glossitis unlike that of pernicious anæmia is, however, seldom painful Koilonychia with longitudinal splitting is seen, and patients often complain of mild paraesthesias in limbs Temperamental changes are common, the patient becoming nervous easily worried and emotional Headaches often of a migrainous type are often complained of, and the musculature is hypotonic and flaby Premature greying of the hair is a characteristic finding Hypochlorhydria or complete achlorhydria are almost constant findings

Blood picture The typical blood picture may be summarised as one with only a moderately reduced red cell count with a severe reduction in the haemoglobin and a very low colour index

[illegible]

Low Hb

The striking feature is the great reduction in haemoglobin with a average of about 7 gm as against the normal value of about 15 gm per cent The resultant colour index is therefore much below 0 6 to 0 9 being common findings The Mean Corpuscular Haemoglobin concentration may drop to 25 per cent or lower (normal 34 per cent)

The blood plasma is very pale and the icteric index is very low The indirect van Den Berg reaction is negative

Bone Morrow biopsy shows a markedly hyperplastic picture with large numbers of small polychromatic normoblasts

Prognosis

Although natural remissions do not occur there is a tendency to improvement or even complete recovery after the menopause Untreated the anaemia causes prolonged and chronic ill health but is rarely fatal

Iron ther

Treatment This group of anæmias responds rapidly and completely to iron therapy It is usually necessary however to administer iron in large doses such as iron and ammonium citrate 6 gm (90 grains) daily, exsiccated ferrous sulphate 0 6 gm (9 grains) daily, ferrous carbonate 3 gm (45 grains) daily or liquor ferri perchlor 8 ccm daily Successful treatment produces a well marked reticulocyte response which may be as much as 20 per cent in severe cases Heath (1933) estimated that with an initial haemoglobin level of less than 50 per cent and with efficient treatment the average rise in haemoglobin is about one per cent daily When the haemoglobin level has reached normal or near normal levels, the dosage of iron is reduced, but iron therapy must be continued for a few weeks more In a few cases it may be necessary to continue administration of maintenance doses of iron for prolonged periods

Dietetic

A good mixed diet with high vitamin content or vitamin supplements is advisable Where hypochlorhydria or achlorhydria is present administration of

hydrochloric acid dil in doses of 30 to 60 minims three times a day with meals is helpful in relieving dyspepsia and aids in the absorption of iron If neuritic symptoms are present it is advisable to give Yeast extracts or *Vitamin B Complex* by mouth

(b) Anaemia of Simple Iron Deficiency

A simple moderate iron deficiency anæmia is extremely common especially in the poorer classes in both sexes and at all ages It is particularly frequent in children who are largely or exclusively on a milk diet as milk is relatively very poor in iron content It is also frequent amongst vegetarians Voluntary dietetic *restrictions in the well to do classes may* often produce a severe anæmia

The blood picture closely resembles that of idiopathic hyperchromic anæmia except that the reduction in hæmoglobin is generally only moderate Response to adequate iron therapy is rapid and treatment *should be on similar lines*

(c) Haemolytic Anaemias

As already stated this is a very important group of anæmias which are caused basically by an increased destruction of red blood cells The resultant anæmia is hypochromic and generally normocytic in the classification of anæmias based on the appearance of the red blood cells In all haemolytic an ... nd ce the icterus index is raised and ... urine is generally high coloured due to ... lobin may appear in the urine After ... and spleen

The aetiological factors concerned in the production of haemolytic anæmis may be broadly classified as follow —

1 *Infective* In tropical countries chronic malaria is perhaps the most important factor Infection with haemolytic organisms such as staphylococci streptococci Cl welchii are common aetiological agents In Oroya fever a severe haemolytic anæmia *frequently develops*

2 *Toxic* A large number of toxic agents cause varying degrees of hæmolysis Common one that may be mentioned are lead the sulphonamide group of drugs the organic arsenicals potassium chlorate snake venom *saponins toxic products derived from extensive burns*, benzidrine phenylhydrazine phosphorus and a large number of other chemicals

3 *Haemolysins* Haemolysins may be introduced from without as in incompatible blood *transfusions or* may be produced within the body itself as in erythroblastosis foetalis and paroxymal haemoglobinuria

4 *Haemolysis due to a congenital defect in the red blood cells*

In Acholuric Fam ... essential developmental defect consists in an ir ... f which they are more easily destroyed in the ... æmia which is practi cally confined to negr ... lls is normal but the cells tend to become ... ygen tension

5 *Haemolytic anaemias of obscure aetiology* In this class are included Lederer s Acute Haemolytic Anæmia and Cooley's anæmia

Haemolytic Anaemia of Malaria

... ll health ... nuch as ... anæmia ... ifections ... produce ... anæmia

As already dealt with in *the discussion on Tropical Nutritional* a… has been shown that chronic malarial infection plays a secondary but a most important role in the … duct on of that d sease

Blood Picture After an acute attack, there is a rapid fall in both the red cell count and haemoglobin and the colour index is normal During recovery phase the red cells are regenerated at a more rapid rate than the haemoglobin and consequently the colour index falls
response In
may show t
characteristic
den Berg reaction is positive

Treatment Energetic antimalarial therapy should be instituted at once and it is generally advisable to supplement this with iron therapy in the usual dosage Crude liver extracts, yeast extracts or folic acid may also be necessary in severe cases which do not respond to iron therapy alone

5. Acholuric Jaundice

Synonyms Acholuric Familial Jaundice Congenital Haemolytic Anaemia Haemolytic Icterus

Definition and aetiology Acholuric jaundice is generally of congenital type but less

Aetiology

and red cell destruction and removal of the spleen results in clinical improvement by virtue of elimination of a large part of the red cell destruction mechanism of the reticulo endothelial system

Excessive destruction of erythrocytes results in a compensatory hyperplasia of the bone marrow and large numbers of reticulocytes are poured into the circulation There is also a granulocytic leucocytosis

Signs and symptoms The course of the disease is characterised by remissions and
adolescence but
ilt life A mild
ed The stools
leen is enlarged
essive exertion
appear from time to time and are accompanied by increase of jaundice fever weakness and increasing pallor The spleen is further enlarged and tender The liver may also be tender and painful and an attack of biliary colic may occur In long standing cases chronic ulceration of the legs is frequently seen.

Blood changes During remissions there is generally only a mild degree of anæmia but during crises and soon after the anæmia may be very intense with the red cells falling to as low as 1 million per cmm and the hæmoglobin down to about 20 per cent There is a leucocytosis upto 50 000 per cmm with numerous myelocytes and immature forms Of the total red cells the characteristic microspherocytes form a high proportion These cells are spheroidal instead of biconcave have a mean diameter of about 6.4 microns and the M C V is reduced to between 62 to 80 cubic microns There is a persistent reticulocytosis ranging from 10 to 20 per cent or more Normoblasts are present even during remissions and are abundant during crises

Increased fragility of the red cells in hypotonic salt solutions is a constant and pathognomonic finding With normal erythrocytes haemolysis begins at 0.45 per cent saline solutions and is complete at 0.34 per cent In acholuric jaundice haemolysis begins at 0.51 to 0.72 per cent and may be complete at 0.45 per cent

The icterus index is raised to 15 to 30 during remissions and during crises may rise to as high as 100 The indirect van den Berg reaction is positive

Treatment There is no specific treatment

PART VIII

DISEASES OF THE SKIN

GENERAL CONSIDERATIONS—ANATOMY OF THE SKIN FUNCTIONS OF THE SKIN—DISEASES PRODUCED BY ANIMAL PARASITES SCABIES, PEDICULOSIS, CREEPING ERUPTION, INSECT BITES—FUNGUS AFFECTIONS OF THE SKIN DERMATOMYCOSIS RINGWORM OR TINEA KERION FAVUS EPIDERMOPHYTOSIS, DERMATOPHYTIDES, TINEA IMBRICATA BLASTOMYCOSIS MONILIASIS ACTINOMYCOSIS MYCETOMA, ERYTHRASMA SPOROTRYCHIOSIS SEBORRHOEA ACNE VULGARIS PITYRIASIS VERSICOLOR—BACTERIAL AFFECTIONS OF THE SKIN STAPHYLOCOCCAL AFFECTIONS STREPTOCOCCAL AFFECTIONS ERYSIPELAS, IMPETIGO CONTAGIOSA ECTHYMA, DIPHTHERIA, ANTHRAX, GLANDERS TUBERCULOSIS LOCALISED FORMS EXANTHEMATIC FORMS, TROPICAL ULCER OR NAGA SORE—VIRUS DISEASES OF THE SKIN MOLLUSCUM CONTAGIOSUM, HERPES SIMPLEX HERPES ZOSTER WARTY GROWTHS, PITYRIA[illegible]
CHEMICAL AGENTS PHYSICAL AGENTS EFFE[illegible]
MA PIGMENTOSA EFFECTS OF X RAYS AND [illegible]
MEDICAMONTOSA, DERMATITIS ARTIFACTA [illegible]
ING THE TEXTURE OF THE SKIN HYPERTROPHIES ICHTHYOSIS CORNS, CALLOSITES PSORO-
ABNORMALITIES IN THE COLOUR OF THE SKIN NIGRICANS DERMATOLYSIS KELOID SCLERO
[illegible] ACROSCLEROSIS LOCALIZED HEMI ATROPHY—
[illegible]
DISEASES OF THE SKIN [illegible]
OF THE SKIN PRURITIS [illegible]
ALOPECIAS

1. General Considerations

(1) Anatomy of the Skin

The skin or integument is an integral part of the body and is in close relationship with the subjacent structures through its connective tissues, blood vessels and nerves It can be considered as an elastic covering of complex structure with certain independent physiological functions and bearing specialised appendages namely, the hair and nails Structurally, the skin consists of three principal layers the *epidermis or cuticle, the dermis or corium* which is the true skin and the subcutaneous tissue

The *epidermis or cuticle* is the outer superficial *layer which is waterproof* and protects the underlying delicate structures like fine blood vessels and nerves *from external injuries* It is composed entirely of epithelial cells of squamous and cuboidal type and is devoid of blood vessels or capillaries Depending on the situation and thickness, the epidermis is formed by three to five layers of cells which are termed from above downwards *stratum corneum, stratum lucidum, stratum granulosum, stratum Malpighii* or the *rete mucosum* and the *stratum germinativum* or basal cell layer *It is from the basal layer* that all the other layers originate [illegible]

on the scalp and thinnest on the eyelids, face, [illegible] aspects of the elbows, groins and sides of the tendo achillis The cells in this

layer do not possess nuclei and are flattened and dry near the surface These cells are keratinised and are partially impervious to water owing to the presence of a waxy substance The *stratum lucidum* occurs immediately beneath the horny layer and is seen in microsections as a thin, even colourless translucent band It is composed of one or two layers of irregular distended cells with vestigial nuclei The *stratum granulosum* is the next deeper layer and is composed of one or more flattened coarsely granular cells with shrunken nuclei lying in vacuole like spaces This layer is very thin o absent in the fine skin at the webs of the fingers etc The *stratum Malpighii* or the rete is also known as the prickle cell layer and is composed of a varying number of polygonal cells distributed in a mosaic pattern' The cytoplasm is spongy and the cells all of which show definite nuclei are united to each other by delicate protoplasmic processes—the prickles In the upper regions these polygonal cells are more or less flattened and in the neighbourhood of the basal layer they are somewhat elongated The *stratum germinativum* or basal layer consists of a single row of columnar cells arranged vertically to the basement membrane separating the epidermis from the corium The nuclei are large, oval and centrally situated and show mitosis In these cells melanin pigment is deposited to which the colouration of the skin is due

Layers of skin

Although the entire surface of the skin appears to be smooth and regular, it is in reality traversed by numerous ridges and furrows distributed according to the folding and stretching to which the skin is subjected during movement Fine lines exist over the entire surface of the body On the flexor aspects of the fingers and toes the distribution is more regular and of a pattern characteristic to the individual The epidermis is anchored to the dermis by means of fine fibrils originating from the corium

The *corium or dermis* is the true skin which like the epidermis also varies in thickness in different situations being thickest on the palms and soles and thinnest on the eyelids, webs of the fingers and toes etc It is built up chiefly [illegible]

Dermis

The pars papillaris or the superficial stratum consists of oval or conical finger like projections 'the papillae' into the overlying epidermis and rests on an irregular ridge like formation of the underlying connective tissue In the papillae are found the terminal capillary loops and certain nerve endings

The pars reticularis or the deeper stratum which is composed of interlacing bundles of dense fibrous tissue commences at the level of the sebaceous glands and merges into the superficial fascia of the subcutaneous tissue Strands of voluntary and involuntary muscle fibres are found in the pars reticularis of these, the striped muscles occur only in the face and neck while unstriped muscles are more numerous in the scrotal and perineal regions in the areola of the nipple and on the scalp Arrector pili muscles originate from the inner sheath of the hair roots and run obliquely to be inserted at the base of the pars papillaris

The corium is supplied with *blood vessels* situated at four different levels where they form plexuses The deepest of these plexuses is formed in the subcutaneous tissues The arterial side comprises a richly anastomosing irregular network of tortuous vessels which send off branches to form the second plexus

Corium

about the level of the sweat glands Extremely fine twigs of arterioles are sent off from the second plexus to form arborising networks in the upper portion of the dermis especially around the sebaceous glands and hair follicles Some of these twigs pass upwards and form the subpapillary plexus with regular oblong meshes from which fine capillaries pass into the tips of the papillæ These capillaries do not anastomose The venous return is from papillary venous capillaries to the subpapillary venous plexus which lies just below the papillæ and anastomosing freely forms a regular network of even sized vessels Almost immediately beneath this is the second venous plexus the two inter communicating freely Two more venous plexuses are seen one immediately deep to the subpapillary arterial plexus and the other at the level of the cutaneous plexus and are composed of large veins supplied with valves

Although there are so many arterial plexuses the corium possesses no blood vessels of its own i e for its own use The true skin receives no arterial blood but depends for its nourishment on the veins and lymphatics

Nerve supply of cutaneous blood vessels

Con

In many

disease,

of sympathectomy periarterial or by removal of ganglia is beneficial

? *Dilators* —Till recently the accepted view was that the afferent fibres of the posterior root system contain also the dilator fibres but Hirt in 1928 showed that the spinal ganglia in addition to the somatic cells contain many autonomic ones including some which send long processes to the periphery and these fibres are most probably the dilators

Innervation of minute vessels —The presence of very fine nerve twigs has been demonstrated which the capillaries entwining them in portions of their length and then switching off to other capillaries thus bringing about a kind of nervous cross connection The tone of the minute vessels can be changed by nervous action independently of the arterioles for example stimulation of the sympathetic can cause the blood to be expelled from the capillaries after the circulation in them has been completely stopped Similarly active dilatation of the capillaries may also result from stimulation of the sensory nerve It is likely that the dilatation ensues indirectly by a *chemical change—the liberation of the Hen substanc* which is responsible for the triple response of Lewis

Control of the capillaries depends on the activity of the suprarenals and the pars posterior of the pituitary and the permeability of the endothelial wall varies directly with the calcium content of the blood These plexuses respond to external and internal stimuli in various ways and the resulting clinical phenomena depend on three factors namely (*a*) dilatation or (*b*) constriction of the capillaries arterioles or venules with (*c*) increased permeability of the capillary endothelium or the endothelium of the subpapillary plexus For example the first effect of cold is pallor which is due to constriction of the capillaries but dilatation of the deep arteries During the second stage the arteries and arterioles contract and the veins dilate giving rise to blueness of the skin In the third stage there is occlusion of the arteries and stasis in the [illegible] gangrene If recovery takes place *in the*

ary capillaries with exudation of

formation of blisters

Contractility of blood vessels

When the skin is lightly stroked with a blunt point there is an immediate pallor from mechanical emptying of blood vessels, this almost disappears but within 15 20 seconds the line of stroke again becomes visibly paler which reaches its maximum intensity in about 45 seconds and gradually disappearing becomes altogether indistinguishable in 5 minutes The white band is sharply defined exactly mapping out the area stroked That this precision is due to active contraction of the minute vessels is proved by Lewis because of the fact that the phenomenon can be obtained in an arm after circulation in it has been completely stopped even up to 15 minutes and does not differ from that in the opposite arm It is independent of the nervous reflexes central or local

(2) Normal Reactions

Lymphatic vessels

In the epidermis there are no *lymphatic vessels* with distinct endothelial wall but numerous intercellular spaces are seen between the cells of the different strata In the papillary portion of the corium a plexus of fine lymphatic vessels accompanies the blood vessels and drains the lymphatic spaces of the epidermis A large number of lymphatic spaces also occur in the corium so much so that the connective tissue bundles muscle fibres and the coil glands seem to float in distended lymphatic spaces' A second coarse plexus of lymphatics is found in the deeper portions of the pars reticularis of the corium where the distribution follows the deep blood vascular plexuses Anastomosing branches are sent off from both these lymphatic plexuses which supply and drain all the structures in the corium

Nerve fibres

Both medullated and non medullated nerve fibres are present in the skin

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ine twigs

idum A

large number of medullated fibres terminate in the apices of the papillae in little oval bodies known as touch corpuscles These touch corpuscles which are of

The non medullated fibres which are derived from the sympathetic ganglia supply the voluntary and involuntary muscles of the skin

The subcutaneous tissue varies in thickness and density in different parts of the body and is composed mainly of irregular lobules of fat distributed in a fibrous network which supports the blood vessels and nerves The superficial fascia forms a resilient base for the whole thickness of the skin to rest upon

The entire thickness of the skin is pierced by the ducts of the sweat glands and by hair follicles The sweat glands and the hair follicles are placed very deep in the dermis the sebaceous glands which accompany the hair shafts occur in the deeper portion of the pars papillaris

The *sebaceous glands* There are holocrene glands and saccular to a multipl racemose gland The sebum is formed by complete disintegration of the lining cells of the glands Meibomian glands in the eyelids and Tysonian glands on the glans penis are modified forms of sebaceous glands Sebaceous glands are found in the corium on all parts of the body except the palms and soles and the terminal phalanges

The *sweat glands* These are merocrine glands and are situated in the sub-

of sweat glands The duct passes upwards spirally through the corium but at the interpapillary portion of the rete this regular spiral appearance is lost The cork screw like course is again resumed at the level of the stratum granulosum and its termination on the surface is marked by a minute funnel shaped depression in the skin

The hair These are horny pigmented cylindrical outgrowths derived from the epidermis and having their roots firmly fixed to pouchlike depressions in the deeper portions of the corium They occur on all parts of the body except the palms and soles the terminal phalanges and the penis Three kinds of hair are found on the human body namely, *(i)* soft or lanugo hairs which have thin minute shafts and grow on the forehead limbs trunk and ear *(ii)* long hairs occurring on the scalp beard and moustache areas pubes and axillæ *(iii)* stiff bristly hairs of the eyebrows and eyelashes. Straight hairs are cylindrical while curly hairs are somewhat flat and ribbon like and are oval in transverse section The root is enclosed in the hair follicle which has three layers The external and middle coats are formed by fibrous connective tissue and are supplied with blood vessels and nerves The inner coat is structureless and homogeneous and does not contain any blood vessels and nerves

The nails These are flat horny outgrowths of the surface epithelium covering the dorsal surface of the terminal phalanges of the fingers and toes The body or visible portion consists of flat translucent horny cells growing from the subjacent rete and resting on the nail bed in the corium The root is firmly embedded in a pocket like recess formed by an infolding of the epidermis The proximal white portion is the germinating matrix the intermediate pink portion is the nail proper and the distal yellow portion is the dead area which is pared off periodically The rate of growth varies with age and the season of the year, being most rapid in young adults and during the summer months The finger nails grow faster than the toe nails

(3) Functions of the Skin

(i) *Protective* The horny layer being keratinised and impervious to water ... on of the subjacent structures This function ... ich keeps the surface ... mical injury is afforded ... y cushion like structure of the superficial fascia on which they are resting ... ie vulnerable points in the skin are the pilosebaceous orifices through which bacteria gain access to the deeper tissues

(ii) *Sensory* The entire body is kept cognisant of its change of environments through the sensory nerves of the skin The special end organs transmit sensation of heat cold pain pressure and tactile discrimination The hair follicles are liberally supplied with sensory fibres and hence the hairs also function as effective tactile organs

(iii) *Regulation of heat* This is done by radiation and evaporation from the entire surface of the skin through the activity of the sweat glands and dilatation and contraction of the blood vessels Heat or cold may act either directly on the involuntary muscle fibres of the vessels or indirectly through the vasomotor system Heat produces dilatation and thereby more heat is radiated owing to a brisk circulation Cold produces contraction of these vessels and radiation from the body is less owing to retarded circulation

(iv) *Secretory* (*a*) *Sweat* A fair amount of water is constantly lost from the body as insensible perspiration which keeps the skin soft and moist The activity of the sweat glands is under control of the central nervous system and is influenced by atmospheric conditions such as temperature and humidity and various physical states such as emotion exercise and nausea The sweat glands are not as much influenced by changes in the chemical state of the blood as the kidneys are Sweat proper is an important factor in the regulation of the body temperature especially in bringing down the temperature of febrile conditions Excretion of nitrogenous and other waste products is negligibly small as sweat proper consists of about 99 per cent of water with certain amount of sodium chloride phospates etc in solution or suspension The composition and consistency vary according to the region and duration of sweating the secretion of the axillary and circumanal glands being thick and oily The reaction is always acid and thus affords a protection against multiplication of bacteria on the skin *Sweat*

(*b*) *Sebum* It consists of an oily semi fluid material composed of fat fatty acids salts cholesterin albuminoid substances and water A certain amount of fatty degenerated cellular debris is mixed with it The secretion varies in quantity according to the situation being most abundant on the face sides of the nose scrotum and the areolæ of the nipples The production of sebum is slow and continuous and is afffected to a certain extent by the vascularity of the skin but the activity of the glands is controlled by the gonads The principal function of sebum is to lubricate the hair shafts and prevent them from becoming too hard and brittle or too easily saturated with moisture It also prevents too rapid and undue loss of heat from evaporation by forming a thin spreading film of oily substance on the skin *Sebum*

(v) *Absorptive* The horny layer is totally impervious to water or alcohol but fatty substances are absorbed to a certain extent The degree of absorption depends on the volatile property of these fats or oils at the low temperature of the body heat

(vi) *Nutritive* The fatty subcutaneous tissue of the skin acts as a store of nutrition in case of emergency and need Nearly one fifth of this lipoid sub stance is present as free cholesterol which is activated by ultraviolet light and thereby exerts its antirachitic effect It is also a great store for glycogen

(vii) *Respiratory* A certain amount of carbon dioxide and a fairly large quantity of water is exhaled from the surface of the skin

(viii) *Melanin pigment* The colour of the human skin is due to the concentration of melanin pigment in the basal layer of the epidermis There are certain specialised cells called melanoblasts situated in the upper layer of the corium which elaborate melanin from the end products of digestion of vegetable proteins especially those derived from the leguminous plants Under normal conditions the colouring matter is secreted by the melanoblasts as an achromatic *Melanin Pigment*

substance and during its drift upwards towards the surface it is oxidised and stored in the basal layer as the dark russet brown melanin Here its principal *function is that of a light filter to protect the fine capillaries* underneath from the injurious effects of strong sunlight The activity of these melanoblasts is controlled by the internal secretion of the suprarenals and anterior pituitary and hence the basic factor in the colouration of the skin is racial or hereditary The colour of the hair and iris is also a racial character for the same reason

(ix) *Immunisation* The skin surface is the great medium for immunisation due to the presence of the Reticulo endothelial system It is a big reserve for glycogen to be utilised when needed The cholesterol in the skin is converted into Vitamin B by rays of the sun

2 Diseases Produced by Animal Parasites (Zoonosis)

(1) Scabies or the Itch

ly in children but also in adults and , burrowing into the epithelial layer y, namely in the webs of the fingers at the wrists around the navel and the nipples on the penis buttocks folds of *the axilla and between the toes In very young children the lesions may be* generalised affecting the palms soles face and the scalp owing to the skin being thin and tender all over the body The tunnel produced by the burrowing parasite is utilised *for laying eggs and the larvæ which are hatched leave the tunnel by* tea ing through the roof thus keeping up the infection by invasion of fresh areas There is violent itching—hence the name the itch which is worse at night The abrasions produced by scratching are very often infected secondarily with pyogenic cocci and the entire clinical picture may be changed thereby This is especially noticed in the case of babies The infection is transmitted by direct contagion and is almost always associated with lack of personal hygiene The disease is often found among the inmates of board ng houses and schools Instances of infection in people of very cleanly habits are occasionlly seen

Treatment The specific treatment for scabies is sulphur but this should be

ointment When

should be given In straightforward cases treatment consists of scrubbing with a hard nail brush *soap and hot water in the morning* to open up the burrows followed by sulphur ointment (B P) which should be rubbed in and kept on for at least 4 to 6 hours The scrubbing and application of ointment is to be repeated before retiring at night *All clothes next to the skin bed sheets* pillow cases counterpanes etc should be sterilised by boiling every day if this is not feasible the patient is kept without a bath and his clothes linen etc are not changed for 3 days and on the 4th day everything is sterilised *by boiling for one* hour The patient is given a good bath with soap and hot water

Sometimes sulphur dermatitis is brought about by the specific treatment being prolonged unnecessarily by the patients themselves as they think that the irritability of the skin caused by the sulphur is due to persistence of the infection *The patients and their relatives should therefore always be warned*

not to continue the intensive treatment after the 4th day Growing children may develop allergic dermatitis and this condition should be carefully differentiated from actual scabies and treated accordingly

Prophyl

sprinkled lightly on the body after bath and on the bed linen at night, is a very good prophylactic agent

The patient is stripped his clothes are fumigated and Vleminckx's solution is painted on with a brush The patient is given a bath with soap and hot water after two hours This solution is prepared as follows quicklime 1 oz sulphur ppt 2 oz water 15 oz boil in an earthen ware vessel till reduced to 10 oz, let it stand for some time and decant off the clear sherry-coloured supernatant fluid

The patient is well washed in a warm bath the whole body is then brushed over with a mixture of equal parts of benzyl benzoates alcohol and soft soap, and as soon as this is dry the process is repeated The patient resumes his clothes, takes a bath 24 hours later and changes the clothes

The patient is well washed with hot water and soda so that the scabs are removed and then the body is well smeared with lather of soft soap containing 18 per cent of sulphur This process is repeated for the next two days Altogether three days treatment suffices to cure scabies

Benzyl benzoate lotion (25 per cent benzyl benzoate 35 per cent soft soap 40 per cent sp
to be 100 per Ben yl
or not the pat
spirit was ver ... per cent benzyl benzoate killing 99 per cent of the parasites A solution containing only 5 per cent proved less satisfactory though more efficient than any other anti scabies treatment except sulphur ointment A solution in spirit is more difficult to use than the benzyl benzoate lotion as it is not easy to distinguish which parts of the body have been covered

Mitygal Mitigal (a *proprietary* preparation of Bayers) is a very efficient remedy for scabies Chemically it is dimethyl diphenylene disulphide The product is however not available at present

Tetraethylthiuram monosulphide in a concentration of 5 per cent is capable of curing human scabies It has been found to be non irritant to the human skin and no instance of cutaneous idiosyncrasy to it has been encountered It is cheap clean easily available economizes in fats and oils

Pyrethrum Treatment—Uncomplicated cases of scabies respond very rapidly to the flowers of *Pyrethrum cinerariifolium* with vaseline The patient is washed well with soap and water in the evening and the freshly prepared ointment is well rubbed on the affected parts and the application is repeated again before retiring to bed A course of five days treatment is advised

DDT has been reported to be surprisingly inefficient in human scabies (Mellanby) A saturated solution in oil or an emulsion in water applied to the skin killed less than 50% of *Sarcoptes* in twenty four hours DDT

(2) Pediculosis

Pediculosis (Lousiness) Three types of the parasite are met with namely P capitis P vestimenti, and P pubis (scrab louse)

P capitis affects the scalp and is spread by direct contagion in schools and boarding houses and from the use of infected hair brush or sleeping with an infected bed fellow The adult louse causes a good deal of irritation of the scalp and is often associated with *seborrhoea oleosa* of the skin Secondary infection of the nature of impetigo is not uncommon and certain amount of matting and falling of the hair is always noticed especially in girls who have their hair long In persons of cleanly habits it is a transient infection but in people in whom a head bath or shampoo is only a luxury it may go on for years and produce actual alopecia *P capitis in long standing cases may invade the body hairs as* well The eggs are laid on the hair shafts and are called nits

For adult lice kerosine oil acts more or less like a specific. The hair should be soaked well with kerosine oil kept on for half an hour and then washed off with soap and warm water This treatment should be given twice a week and in the interval antiseptic hair lotions resorcin 30 gr to 1 oz or B naphthol 20 gr, *to 1 oz should be applied night and morning to destroy the nits All matted hair* should be clipped off

Another effective remedy is carbolic acid which is used as follows —

Patient lies with the head on the edge of the bed and the hair hang down into a basin containing one in 40 acid carbolic The lotion is used to soak all the hair very well taking special care round the nape of the neck and behind the ears *The lotion is repeatedly flown down from the forehead for fifteen minutes* After that the hair are covered by a towel like a turban for one hour A hot bath is then taken and the infestation is generally over

Five days application of 10 per cent pyrethrum ointment in crude vaseline or a pomade made up with white vaseline will effect a complete cure

In cases of women with long hair who object to greasy application watery extract may be applied for *7 days* The watery extract is prepared by soaking 2 ounces of coarsely powdered pyrethrum flowers in about 20 ounces of water for half an hour and then heating in a water bath for half an hour short of *boiling point*

The methods described above have a serious disadvantage that they do not prevent reinfestation and are useless in mass treatment of a community

Busvine and Buxter have investigated some new remedies which exert parasiticidal action for eight to nine days after one application and therefore efficiently prevent reinfestation These medicines are —(i) 25 per cent technical lauryl thiocyanate *in a white oil (ii) 50 per cent lethane 384 special in similar* oil (iii) Derris cream These medicines are used in quantities ranging from half dram for children with thin hair to 2 drams for women with thick hair The hair are separated with one hand and the medicine rubbed on the scalp with the other The patient is then instructed not to wash the head for ten days These medicines have no untoward effect on the patient These medicines are said to give a higher per centage of cures

DDT is the abbreviation given to a chemical compound dichloro diphenyl trichlorethane and has been found to be an insecticide of great value One of its most important properties is persistance of its action over long periods which makes it a very valuable insecticide

DDT has been tested by several workers against *Pediculus humanus corporis* *P humanus capitis* and *Phthirus pubis* Dusting powders impregnations of clothing and liquid preparations for application on the person were tried and DDT in all forms was found most effective in controlling the infestation A powder containing 10 per cent DDT provided complete protection for three weeks and effective control for a longer period If clothes impregnated with DDT emulsion were worn by a heavily infested person the treatment was effective and the suits were effective even through five washings Liquid preparations for application such as a spray on the person have been evolved and found to be satisfactory

The activity of a large number of substances used in lousiness has been compared by Scobbie but most compounds have proved inferior to DDT Compound like laurylthiocyanate etc were effective only if the head was not washed but in case of DDT the protection is provided for 11 15 days even if the head is washed Ccobbie concluded that of all the substances tested DDT gave the best results killing all the lice and persisting long enough to kill all the larvae Furthermore the hair could be washed after treatment with DDT if desired and the medicine still remained effective

Clothing should be put through an autoclave at a temperature of 140°F (60°C) for fifteen minutes
eliminated this procedure
into the scalp or rubbed int
bath is taken to remove the lice and nits A week later this treatment is repeated and hair are examined for nits If present repeat treatment after a weel

P vestimenti or the body louse lives on the clothes and only draws its food supply from the human host by sucking his blood The only way to a radical cure is thorough disinfection of all clothing by steam and hot ironing and strict personal hygiene It is spread by direct contact The parasite is considered by entomologists to belong to the same species as *P capitis* *Body louse*

P pubis affects the pubic hair in both sexes and in men may sometimes affect the hair on the abdomen chest axilla even the eyebrows and eye lashes The bite causes intense itching and the parts affected become almost eczematous owing to the abrasion and drying up of serous exudate It is usually transmitted by intercourse although in rare instances the infection has been picked up from a closet seat The treatment consists of shaving all the affected parts and burning the hair a 10 per cent calomel ointment or β naphthol ointment 10 gr to 1 oz being applied afterwards On the eyebrows and eyelashes (which the sufferer usually refuses to shave or clip off) 0 5 per cent yellow ointment (ung hydrarg oxidi flavi) is used *Pubic louse*

(3) Creeping Eruption

It is caused by larvæ of insects or
producing lesions which
character, and may be en
commonest type of lesic
pronounced at its extendi
the larvæ Creeping eruption due to hookworms is seen amongst labourers in plantations and gardens where the hookworm larvæ are rather plentiful in the soil The commonest sites being between the toes the thin skin by the sides of

Creeping eruption due to hook worms

the tendo achilis or less commonly on the dorsum of the foot The larva migrates mostly at night and causes a good deal of irritation, scratching opens up the burrows which become infected with pyogenic cocci giving rise to secondary impetigo or weeping eczemas

Cleaning up the sores with fomentations or baths in weak lysol (15 to 20 drops to a pint), and application of calamine lotion or ammoniated mercury ointment as the nature of the secondary infection requires In uncomplicated cases without secondary infection best results are obtained by cauterising the area around or just beyond the advancing part with carbolic acid and dressing with weak perchloride of mercury lotion (1 in 3 000) Another effective method is freezing with an ethyl chloride spray

(4) Insect bites

Man may be bitten by a large number of insects such as mosquitoes fleas bees wasps etc The sting of bees is always painful and may be sometimes dangerous because of (*a*) the situation of the sting *e g*, in the fauces or tongue the swelling causing obstruction of the respiratory passages (*b*) the patient may be anaphylactic to the venom and (*c*) the venom may be accidently injected into one of the superficial arteries

bee The poison of a bee is acid while that of the wasp is alkaline or neutral The treatment therefore is to remove the sting by lifting it out with a forceps or scraping it out with the edge of a knife followed by application of a weak ammonia solution which should be dabbed and not rubbed In the absence of that solution of sodium carbonate or even a moist cake of soap may be used in bee string

For a wasp bite vinegar or juice of a lemon will be more effective

The irritation caused by bites of mosquitoes or fleas can be allayed by application of 1 20 carbolic acid or 10 per cent menthol in spirit or by rubbing in an ointment containing carbolic acid 2 per cent menthol 2 per cent or liq picis carbonis 12 per cent

The bites of these insects can be prevented by application of various creams and lotions containing pyrethrum

3 Fungus Affections of the Skin

Fungus infection is very common in the tropics both in the skin and in the general system Each country and even each province has got its own problem to solve as regards the incidence of infection by a particular group of fungi

As the classification of the pathogenic fungi is still very unsatisfactory and uncertain we have followed here classification based on clinical study

(1) Dermatomycosis

In this group is included mycotic infection of the skin with no systemic involvement and this includes all the ring worm fungi

(I) Ringworm or tinea

It is an affection of the hair skin and the nails by a group of mould fungi belonging to the four genera—*Microsporon* *Trichophyton* *Achorion* and *Epidermophyton* For the sake of convenience infection of hair is treated

separately from the infection of the skin and nails, although it is difficult to put these in separate water tight compartments Fungi causing ringworm of the hair belong to the three genera *Microsporon*, *Achorion* and *Trichophyton*

Microsporon infection or Microsporosis or scaly ringworm

Two types are met with—the slow growing human type (*Microsporon audouini*) and the rapidly growing animal type (*M lanosum*)

Microsporosis essentially a disease of children is commonly seen between the ages of 5 and 15, *i e* the school going children whence the infection is acquired and it tends to die out at puberty Both sexes are equally affected The peculiar condition in India is that microsporon infection is confined to the European and Anglo Indian children in the hill station schools and has not been reported amongst the Indian children *Microsporosi*

Source of infection is generally the school infection spreading from one child to others by direct contact or through infected hats towels hair brushes etc

Symptoms —Lesions produced by the human type are mild and those by the animal type are more sharply defined and shew evidence of inflammatory reaction From one or two small pinkish macules or scaly patches the lesions gradually spread to form larger circular greyish scaly patches in which the hairs are broken off leaving about 1/6th of an inch of the stump The stumps are dirty white frosted in appearance The patches increase in size and adjacent ones coalesce If left untreated the disease affects the whole scalp and might cause permanent alopecia In elderly children the disease tends to heal spontaneously at puberty Secondary infection by pyogenic cocci may take place especially in the animal type and might cause the kerion condition Constitutional symptoms are absent *Clinical symptoms*

Diagnosis—In a school going child the presence of multiple patches of alopecia which are scaly together with the finding of broken hair stumps and brittle lustreless hairs is pathognomic of microrporosis

Diagnosis by Wood s filter T[illegible]
are passed through a glass contai[illegible]
a dark room and the scalp is ex[illegible]
Wood s filter the infected hairs show brilliant beads of fluorescence

Microscopic In all suspected cases a few infected hairs should be carefully pulled out with a pair of forceps and placed on a glass slide containing one or two drops of 40 per cent liquor potash in solution and a coverslip put over it When examined under microscope the infected hairs will present the following appearance—from the bulb to about ¼" the hair is ensheathed with small round spores arranged in a mosaic pattern this mosaic pattern is characteristic of microsporon infection

Trichophytosis or the trichophyton infection is primarily a ring worm of the scalp but it also affects the secondary sex hairs in the beard area the pubic region and the axillae and also the nails and glabrous skin The incidence of trichophytosis in Calcutta is nearly half of the total number of ring worm infections of the scalp and of these one [illegible] *Trichophytosi*
causing more than 90 per cent
According to the situation of
are classed—endothrix trichop

the long axis On healing, the favic lesions leave atrophic depressed scars causing permanent alopecia of the affected area

Infection of the nails and the skin being secondary to the scalp, lesions in these places are easily recognised On the skin the characteristic scutula form around each laungo hair and on healing leave atrophic depressed scars Sometimes acute inflammatory condition occurs giving rise to some constitutional disturbances

The nails become thick, brittle, lustreless and raised up from the nail bed

Diagnosis of the ringworm of the scalp

Ringworm of the scalp is essentially a disease of the children so lesions in the scalp of a child should always be suspected to be ringworm unless proved to be otherwise The presence of patches of alopecia or eczematous patches with broken hair stumps on the scalp of a child is almost pathognomonic of ringworm In all doubtful cases very careful and systematic search in a good light should be made to find the broken stumps and confirm the clinical diagnosis by microscopic examination of the hair Repeated microscopic examinations must be done in all doubtful cases and also in all the contacts

Diff diagnosis

Psoriasis—uncommon in childhood, rarely confines itself to the scalp The scales in psoriasis are thin and piled up quickly

Alopecia areata—The patches are altogether devoid of hair, and are smooth and shiny In alopecia areata the patch or patches appear suddenly

Seborrhœa of the scalp Seborrhœa is uncommon between 5 and 15 years of age, the most favourable period for the ringworm of the scalp—the scales in seborrhœa are either fine bran like and dry or they may be greasy and from adherent crusts The patches of alopecia and the characteritsic broken hair stumps are absent in seborrhoea of the scalp.

Impetigo contagiosa—The pustules of impetigo do not confine themselves around the hair follicles There are no broken hairs in impetigo The lesions of impetigo are invariably present in the face and other parts of the body From favus impetigo is differentiated by the absence of the sulphur coloured scutula round the hair follicles and the absence of the peculiar odour

Prophylaxis and treatment

When ringworm of the scalp has been diagnosed every care should be taken to prevent the spread of the disease The affected children should be stopped attending the school and kept away from other children in the family All the children in the family and his class mates and room mates in the school should be examined once weekly for three we
a closely fitting cap of cotton or othe
day or at least boiled The old hats

Treatment As a preliminary treatment the hairs must be cut short—this must be insisted on because it not only facilitate treatment and detection of infection but also helps to estimate the amount of damage and prevent the escape of small patches

The success of treatment of ringworm of the scalp depends on the efficient and quick bringing out the infected hair a process which is by no means easy

In very early cases where a single small patch is to be tackled very careful epilation of the hair with the help of a pair of epilation forceps together with the application of antiseptics might effect a cure but this process requires perseverence and a lot of time.

Depilation by irritants are very painful and not entirely satisfactory, when a small area is involved this may be tried It consists of application of local irritants like croton oil or saturated solution of common salt frequently in the affected area till there are signs of inflammation and the hairs have become loose (artificial kerion) The hairs should then be pulled out quickly and mild soothing antiseptic fomentations given till all signs of inflammation subsides when the disease will also be cured

Depilation by drugs—In this the patient must be healthy not over 10 years of age and the total body weight must not exceed 30 killograms The child is weighed very carefully nude on two different scales and the exact weight is noted Thallium acetate powder is then carefully weighed in the proportion of 8 milligrams for each kilo of the body weight for instance a child weighing 20

[illegible]

... be pulled out quickly, strips of rubber adhesive plaster

[illegible]

... of one week Thallium acetate is a very toxic drug and should be administered cautiously

X ray—In experienced and competent hands depilation by x ray is the most satisfactory method The exposure is given in one sitting and does not cause any pain or discomfort In about 3 weeks time the depilation is complete when the scalp is treated with some mild antiseptics The hairs begin to grow in about 3 months time

In case of favus x ray is the treatment not of choice but of compulsion wherever it is available

Drugs commonly in vogue for the treatment of the ringworm infection of the scalp may be divided into (a) strong antiseptics which are generally used before the depilation and (b) mild antiseptics used generally after the depilation amongst the strong antiseptics may be mentioned—Liq Iodine B P or Liq Iodine Fortis chrysophanic acid 2 to 4 per cent in ointment or 5 per cent in paints with chloroform or gutta percha *Drugs for ringworm infection*

A solution much in use in the Calcutta School of Tropical Medicine is Thymol Cinnamon oil acetic acid 1 per cent of each in Tr of iodine Amongst the mild antiseptics may be mentioned Whitfield's ointment salicylic acid ointment or resorcin in ointment or lotion

(iv) Epidermophytosis (Ringworm of the glabrous skin)

T[illegible] ...tium of Hebra
Tinea ([illegible] The numerous
synony[illegible] and its common

incidence Different authors in different countries and under different conditions have described this disease under different names and described the same causative organism as different species—which is *Epidermophyton floccosum* Although some species of trichophyton cause ringworm of the skin the lesions are identical with those of the epidermophyton and are diagnosed only when cultures of the causative organisms are made

Etiology—Children are rarely affected and the males are more affected than the females

Pressure heat moisture and dead tissues are favourable for the growth of the fungus *hence the disease is prevalent in summer and the rainy season* The sites of predilection are the groin area the under surfaces of and cleft between the toes the axillae and the loin—these areas remain moist from the continuous sweating in the humid atmosphere and the horny layer gets macerated *owing to the friction The primary lesion is almost in one of these sites and* forms a nidus from which the infection spreads to the other parts of the body and once the nails of the hands are affected the disease becomes generalised

Types of lesions vary according to the site but a typical ringworm lesion gives the appearance of a complete ring with raised margin formed by small tiny vesicles The area inside the ring is either normal or scaling due to the fungus infection The lesions increase by peripheral extension and coalescence of adjacent rings

The ringed lesion is common on the trunk upper extremities and face when the latter is involved

In the groin area characteristic appearance is a red scaling area sharply
... secondary infection with the pyogenic cocci
... of the fingers the lesion appears at first as
...ich turns into white sodden epidermis If
down and forms cracks fissures and ulcers

In the instep and soles of the feet the palms and dorsum of the hands the lesions are mostly raised hypertrophic plaques and in the soles of the feet and palms of the hands raised blisters are found of various sizes like dyshidrotic eczema, called pompholyx

Amongst the signs and symptoms may be *mentioned the scaly patches giving* rise to intense itching resulting in the breach of surface due to scratching and secondary infection with pyogenic cocci Sometimes due to chronic irritation the affected parts become thickened raised and rough like lichen and are very irritable *This condition is very resistant to treatment Diagnosis of ringworm* of the skin is not very difficult and in doubtful cases the scales should be scraped off and examined under microscope after *treatment with 40 per cent liqor* potash solution Intersecting septate mycelial filaments will be seen going across the scales

Ringworm of the nails Ringworm of the nails is always secondary to the infection elsewhere and it may be due to a trichophyton or the epidermophyton or favus The infection usually takes place as a result of scratching the infected parts which the patient cannot help The infection starts from the distal end and very soon spreads upwards to the root through the nail bed It is the nail bed where the fungus forms the nidus and thence invades the nail plate The nail plates become thick opaque and chalky in colour they loose their lustre and become brittle The fungus is easily demonstrated from the scrapings of the nails when treated with caustic potash

Treatment The treatment of ringworm infection depends upon the acuteness or otherwise of the lesions the presence or not of the secondary infections and the site and nature of the lesions Secondary pyogenic infection should be treated first before any fungicidal medicines are applied Streptococcal infections should be treated with application of warm acriflavin lotion (1 5 000) three or four times during day and ammoniated mercury ointment at night *Treatment*

Staphylococcus infection should be deal with by the application of 2 to

lotion are indicated

When the secondary infections have subsided and weeping has stopped fungicidal remedies may be tried as follows —

In the trunk upper extremities and face where the epidermis is thin Whitfield s ointment is by far the best In chronic cases pigment resorcin containing 40 grains of resorcin to oz 1 of Tr benzoin Co applied twice daily suffices to effect a cure In the feet and back and in other areas giving rise to hypertrophic plaques a stronger remedies are required such as 2 to 4 per cent chrysarubin or its stainless derivative cignoline in ointment or in acetone base may be used if the area is not a large one Ringworm paint of the Calcutta School of Tropical Medicine is a fairly strong remedy containing resorcin 1 dr salicylic acid 1 lycerine 2 dr Tr Benzoin Co 6 in and the horny layer is often r should be taken Warm compre pint of water half an hour in the morning and evening and the application of 1 to 2 per cent of watery solution of gentian violet after each washing will generally allay the itching and prevent the secondary infection When the epidermis has become healthy again Whitfield s ointment applied twice daily will cure the condition if applied for a long period Even after an apparent cure the parts should be dusted morning and evening with sulphur and camphor dusting powder In areas under the toes and in the nails of the fingers and toes treatment should be according to the state of affairs When inflammatory reaction and swelling is present hot antiseptic fomentations and soothing applications are indicated In case of sores without inflammation alcoholic solution of gentian violet and brilliant green is indicated and when the ulcers heal up stronger remedies like resorcin paint or ringworm paint should be applied

Prophylaxis In the tropics prophylactic measures against ringworm infection is not only of importance but imperative and this should be scrupulously adhered to during summer and rainy season In all cases of ringworm even after a cure prophylactic measures should be continued to prevent relapses which are very common People who get ringworm infection once should adopt this measure every summer and rainy season The clothing should be of light material and loosely fitting The parts which are subject to much sweating and friction should be cleaned with a mild antiseptic and kept dry with dusting powders The socks and underclothing are better boiled every day A good method is a daily wash of the axillae groins and the feet with a weak lysol solution wipe *Prophylaxis*

mats and even coir matting

(2) Dermatophytides

Certain skin lesions are sometimes associated with ringworm infection o the hair or smooth skin away from the site of the fungus infection These ski lesions do not show the presence of any fungus but have been proved to be closel related to the ringworm infection elsewhere in the body These lesions calle *dermatophytides* have been described as an allergic phenomenon from the fungu infection Any of the ringworm fungi may give rise to this phenomenon o hypersensitiveness and the lesions are called trichophytides microsporides an epidermophytides according as the causative organism is a trichophytor microsporon or epidermophyton Subjects suffering from these allergi manifestations usually give positive reaction to the trichophytin test. Trichophyti is a plurivalent extract of several fungi, and when the diluted extract is giver interdermal injection in 0 1 ccm doses a local reaction of redness and infiltra tion in 24 to 48 hours occurs in positive cases Cheiropompholyx of the palm of the hands is often due to ringworm infection in the toes Certain pinkish a c slightly itchy rashes occur in the extremities due to the infection in the feet or nails

The microsporides may take the form of (1) Seborrhoeic dermatitis consist ing of pinkish papules or patches with a furfuraceous centre chiefly on the neck and chest, or (2) a lichenoid eruption consisting of bright red grouped follicular papules with horny spines or with fine scales chiefly on the trunk and extremities The trichophytides may take the nature of any of the above

(3) Tinea Imbricata or Tokelau

This is the infection of the smooth skin by endodermophyton concentricum and its variants, and is common in Ceylon Pacific islands Malay Peninsula China, etc A few cases have been reported in India The disease usually begins as one or more small round patches, slightly raised Soon a ring of flaky scales is formed This ring increases in size by peripheral extension and in the meantime another ring starts in the centre inside the first and so on until a large roundish patch is formed containing several concentric rings—which may be compared with the formation of ripples produced by a stone thrown into a pool of water If left untreated other areas become infected and several systems of concentric rings appear which may overlap one another, and thus gradually the whole body is covered with these rings

The scales are greyish or brownish in colour flaky and thin A well advanced case may give the appearance of a case of exfoliative dermatitis The fungus does not usually infect the hairs or hair follicles General health is not affected and besides itching there is no other subjective symptom

Treatment These case should be treated like the Tinea cruris Secondary infections and inflammatory conditions being rare stronger remedies like Whitfield s ointment or resorcin benzoin paint may be more freely used

(4) Blastomycosis

In this are included infections by the yeast or yeast like fungi—the cryptococcus and oidium Infection by the monilias belongs to this group but is treated here separately because of its certain peculiar characteristics

All these infections may be cutaneous which is characterised by raised verrucose lesions or multiple abscesses and ulcerations of the skin or these may be systemic causing miliary abscesses in the internal organs pyemia septicemia and ultimate death

The initial lesion may be (1) papulo pustular (2) papillomatous or (3) gummatous type arising from subcutaneous layer of tissue These papules or nodules are reddish brown in colour soft and tender They gradually spread and become irregular raised patches covered with warty projections which may be dry or moist oozing sero purulent or sanguinous discharges The margins of the patches are irregular or serpiginous and dull red or purplish in colour and slope down to the healthy skin When seen with a hand lens the patches are found studded with miliary abcesses After a time retrogression takes place with the formation of scars which are irregularly distributed like small islands throughout the patch The disease is auto inoculable and multiple lesions are very common

Secondary infection with pyogenic cocci may cause inflammation and suppuration

Treatment—Treatment consists of administration of potassium iodide in heroic doses (from 200 to 400 grains a day) A combination of iodide internally and X ray externally seems to be a favourite treatment now a days

(5) Moniliasis

Monilias may produce lesions on the skin and mucous membranes besides affecting the internal organs

Lesions on the mucous membrane—In the mouth this fungus causes thrush It is characterised by membranous patches on the tongue and mucosa of the cheeks whitish or yellowish white in colour Removal of the membranes leave raw red surfaces In the corner of the mouth and on the lips an erythematous dermatitis called perleche occurs which is very persistant and often mistaken for bacterial infection *Thrush*

In the vaginal mucous membrane it may give rise to membranous or purulent vaginitis suggesting gonorrhoea and monilial ulcerations of the labia is not uncommon Monilia infection has been reported in the anus and circum anal skin especially in children where the subject is suffering from associated gastro intestinal infection due to monilia

Skin—Lesions of the skin caused by the monilias may be divided into (*a*) generalised type (*b*) intertrigenous type (*c*) onychia and paronychia (4) dyshidrosiform eruptions

Generalised type—In adults this condition arises from continuous water bath treatment and in the infants it usually spreads from the anal or inguino crural region In infants the anal region is often affected from moniliasis of the gastro intestinal tract or from napkins Form these regions the infection very soon [illegible]
the [illegible]
dirl [illegible]
sma [illegible]
epidermis The lesions increase peripherally and by confluence with adjacent lesions to form larger plaques the centre of which is red the margins desquamating In older lesions the stage of desquamation is usually both intensive and extensive

Intertrigenous type—This type is fairly common in adults The anatomical regions susceptible are the intergluteal inguino crural interdigital folds and in stout women under the breasts Factors predisposing the monilia infection of the skin by rendering it a suitable soil for the growth of the fungus in these

regions are constant perspiration and friction in these parts thus macerating the protective horny epithelial layer Diabetes and other debilitating conditions is another factor in causing the growth of the fungus The primary lesions are

or pinkish base like that of a ringworm lesion This type is commonly seen in the *interdigital folds*

Dysidrosiform moniliasis—Occurs on the palms of the hands and soles of the feet It may occur as a primary condition or in association with the interdigital types Persons whose hands and feet perspire abnormally are liable to this malady The lesions closely resemble epidermophytosis and consist of discrete deep seated uniform sized vesicles with or without desquamation

Involvement of the nails—The nails may be involved primarily which is a rare condition or secondary to infection in other parts such as extension from paronychia or adjacent skin infection The clinical picture is that of onychia due to other causes The affected nails are lustreless brittle opaque friable and present irregular heaped up hyperkeratotic masses on their surfaces The nails lie separated from the nail beds due to the heaped up scales When the nails are affected it becomes extremely resistant to treatment and the only way is to pull out the nail under anesthesia and treat the nail bed

Paronychia—This is much more common than affection of the nails and occurs mostly in women who have to wash cooking utensils or handle sugar or are engaged in work necessitating frequent immersion of the hands in water

The condition is characterised by peculiar pad or blister like swelling of the nail walls which emits a bead of pus when squeezed The condition is very painful and intractable

Treatment—This depends on the situation affected In the buccal cases the mouth should be washed with 2 per cent aqueous solution of borax and potassium chlorate and then painted with 1 per cent silver nitrate solution or ¼ per cent chromic acid

Lesions *in the intertriginous parts* are best treated with foot bath of weak lysol solution 15 drops to the pint of hot water and then painting the parts with 2 to 5 per cent gentian violet in 10 per cent alcohol or resorcin grains 40 to 1 oz of tincture of benzoin In the interdigital spaces Whitfield s ointment or in chronic cases 5 per cent silver nitrate solution In perleche from monilia 5 per cent silver nitrate solution generally effects a cure

In paronychia a prolonged treatment is required When the *condition is* very painful and acute and inflamed the *fungus* should be immersed in warm saline solution or weak acriflavine lotion for half an hour every day and then painted with 5 per cent silver nitrate solution or gentian violet Working in a bakery or washing cooking utensils must be avoided

(6) Actinomycosis

Actinomycotic or myocardial infection of the tissues may be cutaneous or visceral The cutaneous lesions may be primary or secondary to a deep seated involvement of the bones or muscles

Primary lesions of the skin and nails—These lesions are superficial affecting the horny skin of the palms of the hands and soles of the feet and the nails It is common in the humid planes in the summer and rainy season The subjects are mostly gardeners maid servants and those connected with washing utensils Clinically these types are usually met with namely—haja or sodden skin phata or cracked foot and chaluni or sieve like condition of the skin of the soles of the feet or palms of the hands The toe nails when affected appear thinned out worm eaten and lose their lustre and become brittle The characteristic lesions are keratolysis of the horny layer in patches (haja) or in small circular pits (chaluni) going as deep as the true skin Secondary infection and abcesses are common complications and may cause serious incapacity Fissures and cracks between the toes may go deep down to the true skin

Treatment—Secondary infections and inflammatory reactions if present should be treated first with the usual palliative measures afterwards the lesions should be painted twice daily with commercial formalin ½ to 1 dr to 1 oz of water or glycerine

Actinomycosis of deep l[...]

Actinomycotic infection of the deeper layers of the skin is often an extension from an underlying bone or periosteum lesion Primary lesions may occur from [illegible] from chewing [illegible] Cattle and [illegible] primary lesion occurs as a single nod[illegible] wards involving the [illegible] and ruptures exuding fine sulphur yellow granules The lesion gradually increases and many more [illegible] side with the primary nodule new nodules [illegible] cy to coalesce and form a large solid patch In the early stages the single discharging [illegible] [su]perficial syphilitic gumma or a tuberculous [illegible] as the lesion increases with multiple sinuses discharging fine sulphur yellow granules the diagnosis presents no difficulty Sometimes the affected skin becomes hard uneven lumpy and dusk purplish in colour The course of the disease varies In some cases the disease may be confined to the skin and subcutaneous tissue and of indolent type progressing very slowly in the acute type the progress is rapid and causes destructive changes in the muscles the viscera and bones

As a rule the affection remains local and causes no general interference but if the fungus gets entrance in the blood strain or infects any internal organ very serious and even fatal issue may result

Treatment—Internally Iodide of potassium has been found to be effective in certain cases the iodides having a selective action as in case of syphilis Large doses of iodide is necessary it is given in gradually increasing doses working up to 30 or 40 grains three times a day A vaccine prepared from the fungus has in some cases proved useful

Locally—The treatment is on general antiseptic principles The sinuses should be opened up scraped well and washed with antiseptic lotions Where the lesion is small and definitely localised this may be excised X ray exposure is sometimes of value in treating the wounds

foot

Mycetoma—or Madura foot is characterised by variously sized and shaped swellings with degeneration of the affected tissues where the cutaneous surface are covered with sinuses or fistulæ that discharge a sero purulent oily fluid in which variously sized and coloured grains the mycotic aggregations are suspended.

The disease usually affects the foot where the primary inoculation is on the sole or inner side of the foot but cases have been reported where the knee leg or trunk have been affected.

The lesions may be caused by several species of a group of mould fungi. The organism enters the tissue through abrasion in the skin caused by pricks from spines of plants or splinters of wood or from cuts from sharp stones or knives. It is essentially a disease of the agricultural country and the victims are barefooted people working in the field.

The initial lesions consist of a circumscribed indurated swelling. After a time a vesicle forms on the surface which softens and eventually breaks down in the centre to form a fistulous opening from which oozes a seropurulent oily discharge in which are suspended granules of different colours according to the species of the fungus. The common varieties met with are white or yellow, black and red. Gradually new nodules appear alongside the primary lesion and undergo the same stages of degeneration giving the foot a tuberculated appearance. The foot becomes swollen and assumes a deformed appearance. It increases in breadth, the arch swells up, the toes raised and the ankles swollen. The diseased tissue gives a peculiar elastic feeling like India rubber when touched. The skin lesion is dark, dirty and studded with numerous fistulous openings giving out the peculiar discharges. If a tube is inserted it goes deep down to the bones and can be passed in various directions without causing any pain. All the tissues including the bones, with the exception of tendons and fascia, are affected and degeneration occur beyond repair, the foot assumes the appearance of homogenous mass. Above affected area the leg becomes thin and atrophied and the foot becomes useless, the patient walking in his heels. The peculiar feature in this disease is the absence of pain throughout the process of degeneration except a little pain occasionally in cold weather. The course of the disease is very slow and general health remains unimpaired.

Treatment—There is no specific treatment for this condition and unlike actinomycosis madura foot does not respond to Iodides. In early cases excision of the nodules well wide of the diseased area or cauterisation may arrest further progress. When the disease is fairly advanced amputation is the only course left. Actinomyces are sensitive to penicillin and this treatment has been tried in actinomycosis with certain amount of success. Administration of 300 000 units per day for two to three months are required. Filtered Rontgen rays are also useful.

(7) Erythrasma

Really Erythrasma is a saphrophytic condition not accompanied by any pathological changes and is characterised by a brown or reddish colouration of the skin accompanied by fine brany desquamation. It is generally found in the moist areas such as the axillae groin and folds of the abdomen and occurs in the summer or during monsoon months. The causative organism which was previously known as *Microsporon minutissimum* is now being placed in the group of nocardia.

Treatment —The parts should be kept dry Spirit Hydrarg Biniodide lotion (1 in 5 000) is applied twice daily and when dry dusting over with Sulphur Camphor dusting powder usually cures the condition rapidly but it is apt to recur every summer

(8) Sporotrichosis

It is a subacute or chronic infection by one of the several species of fungi of the genus *Sporotrichum* and is characterised by the appearnce of granulomatous nodules in the skin or subcutaneous tissues or the infection may be systemic involving the bones and internal organs

In the skin the fungus generally gains entrance through an injury—a prick an abrasion in the exposed part Through contamination in food the sporotrichum might infect the mucous membranes of the mouth the larynx and the intestines In the skin or subcutaneous structures the lesiones are of two types namely (a) the fungus gets entrance to the skin by a cut or abrasion causing an ulcer an acneform pustule a gumma or an abcess After a variable period of from a few days to weeks the regional lymphatic are involved causing ascending lymphangitis characterised by a painless cord like swelling of the lymphatic vessels In association with the lymphangitis small cutaneous nodules appear run an indolent course and gradually break down to form small abcesses surrounded by a red areola (*b*) The second or dissem iated type consists of multiple cutaneous and subcutaneous nodules or abcesses distributed in the body At first they begin a small nodules which are hard but painless the skin over these are unaltered in colour Gradually the nodules increase in size and then softening takes place the skin assumes reddish or livid colour and breaks down with the formation of fistulous openings The exudate is either serous or yellow viscid homogenous [illegible] gular openings and When the abcesses [illegible]trices or irregular [illegible]crateriform These ulcers simulate subcutaneous [illegible] structures may [illegible] bones Mucou[illegible] and pharynx [illegible]

Simple type

Dissemin type

Diagnosis is not difficult if the chance of infection by this fungus is remembered and in all cases this should be confirmed by isolating the organisms in culture

Treatment —Potassium iodide should be given in large doses upto 1 dram three times daily The wounds should be swabbed with tincture of iodine and dressed with collosal iodine oil

A saturated solution of potassium iodide is given in initial doses of five drops three times daily before meals in water It is increased by five drops daily until signs of intolerence develop (salivation burning in mouth headache conjunctival irritation) Often 200 to 300 drops are given daily Intravenous injections of sodium iodide may be given instead of the oral route

Potassium iodide

(9) Seborrhoea

The exact cause of this condition is not known though a monilia the acne bacillus and *Staph albus* have been incriminated Important predisposing factors include diet harmonal factors emotional disturbances etc There are two phases

shotty to the feel Extension may occur to the trunk and extensor surfaces of the arms and forearms and sometimes the whole body as far down as the lower extremities may be involved The condition is very distressing when a large area is affected, it causes great irritation and the patient is seen scratching almost all the time

Treatment—Sulphur is the sheet anchor of treatment in this disease Any of the sulphur lotions of which the following are used more commonly can be applied after bath *Yellow sulphur* lotion consists of precipitated sulphur 30 gr, glycerine 10 min, absolute alcohol 2 dr, lime water 2 dr and water 1 oz The *compound sulphur lotion* consists of precipitated sulphur 1 dr rectified spirit 2 dr salicylic acid 10 gr tragacanth powder 5 gr, and water 1 oz The sulphur lotion should be rubbed well on the affected area which is then dusted with a powder containing precipitated sulphur 1 dr camphor ½ dr, acid benzoic 2 dr starch powder 5½ dr When rapid desquamation is required *white sulphur lotion* consisting of sulphuretted potash 15 gr, zinc sulphate 15 gr, tragacanth powder 4 gr water 1 oz can be used

It should be explained to the patient that the nidus of infection is in the roots of hair and regular treatment of the scalp with shampoo and resorcin or curesol hair lotion is essential Mustard oil has a certain amount of inhibitory action on *Malassezia ovale* and can be used with advantage European patients however do not like the greasy feel in the hair Beta naphthol 20 gr dissolved in an ounce of cocoanut or olive oil can be used for soaking into hair overnight which can be washed off with spirit soap shampoo the next morning For extensive cases involving the face and body separate towels for drying the head and the face and body is recommended Swabbing the forehead back of the neck ears axillæ and groins with rectified spirit every day after the bath prevents spread of the infection on the body

(10) Acne Vulgaris

It is an inflammatory condition of the sebaceous glands caused by *Malassezia ovalis* The predisposing causes are (i) age—it occurs during puberty when the sebaceous glands undergo full and rapid development along with the attainment of functional maturity of the gonads (ii) constitutional disorder e g anæmia (iii) constipation and (iv) too highly fatty food or excess of carbohydrate in the diet The determining cause is infection by the fungus and the contributory cause a secondary staphylococcal infection leading to suppuration The excessive secretion of the sebaceous glands favours the growth of the fungus which obstructs the gland mouths and thereby sets up local irritation The plug obstructing the mouth of the glands is called the comedo and consists of the desquamated horny epithelial cells and a mass of fungi The obstruction causes a condition of partial anærobiasis which favours the growth of the acne bacillus The commonest sites of this affection are the face and forehead but the upper part of the back and front of the chest are also affected

Treatment—(i) General Correction of constipation dyspepsia or anæmia and improvement of the general health are very important Diet should be light and easily digestible (ii) Seborrhœa should be effectively treated (iii) Local The comedoes should be pressed out with an extractor and not by means of the finger nails The face should be washed in hot water—as hot as the patient can bear—and sulphur or spirit soap and then one of the sulphur lotions applied

locally When suppuration has taken place the boils should be lanced and antiseptic compresses applied Staphylococcal vaccines are sometimes useful in suppurative cases In severe and intractable cases X rays improve the condition

Weekly injections of 1 c cm of Antuitrin S (P D & Co) have been found to be very effective after the secondary infection has been removed

(11) Pityriasis Versicolor

(Bengali—*Chuli*) The lesions in this condition consist of yellow or yellowish brown slightly scaly macular patches mostly on the trunk face neck and sometimes on the upper extremities As a rule it does not extend to the lower extremities Except for causing discolouration of the skin and slight itching it does not produce any subjective symptoms It is really a saphrophytic infection of the fungus Microsporon (furfur) and does not cause any pathological changes The disease is commonly seen during summer and in the rainy seasons *Chuli*

Treatment Hot bath with sulphur soap for toilet and then application of one of the sulphur lotions The sulphur camphor dusting powder should be used as a prophylactic for some time after the cure is effected and in the beginning of every summer and rainy seasons

4 BACTERIAL AFFECTIONS OF THE SKIN

(1) Antibiotics and Sulphonamide in Dermatology

From the practical standpoint the question to be decided is whether the eruption is largely due to staphylococci or streptococci or any other organism sensitive to these drugs For instance if the organisms are penicillin sensitive improvement and cure may reasonably be expected If the infection is superficial good results may usually be anticipated from local therapy If it is relatively deep seated as in boils and carbuncles penicillin is best given parenterally

How should penicillin be applied to the skin? Applications in powder form have not been widely used An aqueous solution containing 200-1000 units per ccm applied as a spray seems to be the best method The atomiser used should be of glass or should have a glass reservoir with tube and nozzle made of some metal does not destroy penicillin An ordinary throat spray has often been successfully employed The reservoir should be emptied frequently and sterilised at least once every five days to prevent contamination of the solution The spray is applied from three to six times every 24 hours to the affected areas thoroughly but not wastefully with solution An ointment containing about 500 units of penicillin per gram is suitable and as a rule the supply should be renewed every 10 14 days for the potency slowly deteriorates some 30 per cent being lost in a fortnight under the normal conditions of weather If the lesion has not responded in a week it will probably never respond to penicillin and some other treatment should be adopted There is a risk that long-continued application will sensitize the patient's skin to penicillin though this risk is slight compared with that of sulphonamide sensitisation Penicillin can also be applied to the skin as penicillin ointment *Sulphonam*

The application of other antibiotics in skin affections is yet in its infancy Streptomycin has been in tuberculous affections but the degree of its efficacy is yet to be determined

(2) Staphylococcal Affections

Infection of the skin by these organisms may be divided into three main groups (a) superficial infection of the hair follicles causing suppurative folliculitis (sycosis), (b) infection of the sebaceous glands and adjacent tissues causing a certain amount of tissue necrosis and formation of limiting barriers —boils and abscesses (c) infection of deeper structures such as sebaceous gland and sweat glands with extensive tissue necrosis and tendency to rapid extension—carbuncles Staphylococci are universally present on cutaneous and mucous surfaces which are in contact or in communication with the external air So long as there is no breach of surface from external injuries chemical or mechanical staphylococci can be harboured for an indefinite period without causing any lesions The organisms can sometimes gain entrance into the deeper structures by lymphatic permeation The most important portals of entry are the dilated mouths of sebaceous sweat or mucous glands even though the surface of the skin or mucous membrane may remain intact Depending on the vitality of the tissues invaded and the toxicity of the strain of staphylococcus there may be produced simple boils involving only the hair follicles abscesses with a certain amount of necrosis of tissues and formation of limiting barriers to the inflammatory process or carbuncles with extensive sloughing of the tissues tending to spread fairly rapidly in all directions The primary lesions are not very difficult to diagnose and in all the lessions whether superficial or deep the four important signs and symptoms are always present namely pain heat redness and swelling

Superficial infection The hair follicles of the moustache and beard areas front part of the legs front and outer sides of the thighs and the pubic region are sometimes infected by staphylococci giving rise to a condition called sycosis (barber s itch or coccogenic folliculitis) Each hair shaft is surrounded by an inflammatory pustule the follicles are distended painful and irritable the skin between affected follicles being erythematous and painful There is always a tendency that the hair is completely destroyed and the s particularly intractable disease in the shaving a by infection of fresh follicles by the razor blade In India friction of the border of the dhoti or sari keeps up the disease in the skin areas In rare instances all the follicles of the body hairs including those of the eyebrows and eyelashes may be affected

Treatment Patients should be advised to give up shaving for some time The skin should be cleansed with warm olive oil and gentle friction with a piece of soft muslin or gauze followed by swabbing with weak antiseptic lotion *e g* 1 per cent carbolic lotion Hot boric compress is useful in cases with acute inflammatory reaction Manual epilation of all loosened hairs should be done morning and night A very useful and reliable remedy is 5 per cent gentian violet lotion in 20 per cent alcohol —(gentian violet 20 gr absolute alcohol 1½ dr and water 1 oz)—painted on morning and night or combination of gentian violet and brilliant green 2 parts of each made up with 10% alcohol

The only objection is the staining of the skin which is rather difficult to wash off Other aniline dyes have been tried with fairly good results but the same objection holds for all the remedies in this group Vaccine therapy yields very indifferent results Successful epilation of the affected area definitely established a cure for which X rays have been very effective It is not advisable to expose large areas over a long period as it may produce X ray dermatitis or burns

Prophylaxis has to be carried out by the patient with meticulous care The razor blade should be washed thoroughly with soap and water and wiped down with 20 per cent formalin solution immediately after shaving, the brush should be kept soaking in 20 per cent formalin lotion for half an hour and washed thoroughly in water immediately before use All cuts and abrasions during shaving are to be touched with absolute alcohol which can also be used for swabbing the beard and moustache area after the shave If the skin feels too harsh and irritable salving with liquid paraffin at night has a very soothing effect and ensures an easier shave the next morning Too frequent washing with soap and water is decidedly harmful *Prophylaxis*

Boils and Carbuncles—In the initial stage when the boil is just coming up, the best treatment is to apply cold compresses to reduce the hyperæmia and relieve the tension on the soft tissues Weak antiseptic lotions *e g*, acriflavin 1 in 5,000 carbolic acid 1 in 100, or plain calamine lotion can be used with advantage and this line of treatment may abort the formation of a boil or an abscess in a certain percentage of cases Exposure to ultraviolet light is very beneficial at this stage and sometimes prevents formation of the abscess There should be no surgical interference unless and until pus has formed and the abscess is walled off from the surrounding tissues by a barrier of granulation tissue After lancing, a hot compress, changed every 4 hours is recommended to dislodge the adherent slough The hot compress sometimes inf hi e the axilla or pubis The absolute alcohol morning and n skin thus making it more resist up, it should be dressed with borovaseline ointment Staphylococcal vaccine is not of any great curative value but it is a good prophylactic for people susceptible to 'mango boils' which recur with almost unvarying regularity every summer and rainy season Usually, such people are subject to active seborrhœa of the scalp and treatment should be directed towards this important focus in order to prevent relapses Recurrences and resistance to treatment are in a small percentage of cases, due to lowered defensive power of the tissues—local kataphylaxis such cases require internal administration of calcium manganese or tin salts to restore normal tissue metabolism Prophylaxis is adopted on the same lines as for seborrhœa For carbuncles hot boric compress and exposure to ultraviolet light are useful in the initial stage When there is marked œdema of tissues or extensive sloughing, the affected area should be incised and dressed aseptically Vaccines are useful at this stage and local packing with gauze soaked in antivirus lotions are effective *Boils*

Administration of sulfathiazole by mouth has proved of some value in multiple furuncles and carbuncles Five percent ointment of the sulfathiazole powder has also been found useful *Sulphathiazo Treatment*

Staphylococcal infection of the deeper tissues sometimes produces granulomatous nodules growing above and out of the general skin surface The condition is called *granuloma pyogenicum* or *botryomycosis*

(3) Streptococcal Affections

Streptococcal infection of the skin is superficial in character and produces a good deal of induration of the tissues with accompanying lymphangitis and a certain amount of constitutional disturbance These organisms are present in healthy tonsils teeth, intestines and other mucus surfaces but are hardly ever found on the surface of the skin The extent of damage to the tissues depends,

as in the case of staphylococci on the susceptibility of the patient and toxicity of the infective strain Streptococcal infection of the skin may be divided into (*a*) acute infection of the skin spreading rapidly through the lymphatics—*erysipelas* (*b*) subacute superficial infection—*impetigo contagiosa* and (*c*) chronic infection which is mostly localised—*ecthyma*

(i) Erysipelas

The skin and subcutaneous tissues are acutely *inflamed and there is infiltration* of the deeper tissues Clinically the appearance varies from a transient hyperæmia to intense inflammation vesiculation or even sloughing There is localised swelling redness and heat the border is raised brawny and indurated and the infection advances rapidly along the lymphatics The centre of the lesion is paler than the margin and here the skin shows early degeneration The onset is generally preceded by malaise and depression and is accompanied by severe constitutional symptoms *The fever which is often preceded by a fairly prolonged* rigor may rise as high as 105°F All the symptoms of severe intoxication mainly headache vomiting anorexia and joint pains are present there is marked leucocytosis In severe cases bronchopneumonia hæmaturia cutaneous petechiae septic embolism or meningitis may supervene within two or three days of the onset Such cases end fatally especially in the two extremes of life Cases of moderate severity however run an acute course lasting for about a week or 10 days after which the cutaneous inflammatory reaction subsides the advance is arrested the temperature comes down by lysis and general toxic symptoms gradually clear up The affected area may remain hyperæsthetic for a considerable time after cure and show impaired capillary circulation alopecia thrombophlebitis or telangiectasis Recurrent types of erysipelas have been described which are consequent on an active septic focus in the bowels teeth tonsils or throat and nose the cli[illegible] phœdema with access of [illegible] is short lasting about 3 [illegible] are not very severe Any part of the body may be affected and repeated attacks at the same place result in a good deal of thickening of the subcutaneous tissues—a condition commonly known as *elephantiasis nostras* The first attack is usually the most severe Erysipelas of the facial area consequent on scratching an acne lesion is not only fairly common but is often fatal especially diabetic subjects

Treatment—Palliative treatment is given during the acute stage The patient should be strictly confined to bed with an ice cap if the temperature is above 102 4°F Diuresis should be encouraged by frequent drinks ice should be given to suck to control vomiting Bowels should be opened with small enemata rectal saline with glucose may be given if persistent vomiting interferes with the intake of nourishment Alkaline mixtures are useful in so far as they help elimination Tinct perchloride of iron in 15 min doses can be *given with* advantage when the irritability of the stomach has abated Liquid diet *e g* barley water gruel diluted milk (if tolerated) glucose raisin tea etc should be given in small quantities and at frequent intervals feeds should be iced to guard against recurrence of vomiting *Local* Iced compress of weak antiseptic lotions *e g* acriflavin (1 in 5 000) or boric acid 5 per cent are very useful lotio ichthyol 10 per cent has also been found useful The inflamed skin should be dusted with talcum powder and the area just beyond all *around the advancing* edge painted thickly with surgeon s collodion or tincture perchloride of iron All vesicles and pustules are carefully punctured with strict aseptic precautions and

covered with dry dressings surgical interference is necessary only when an abscess has formed When the acute stage has subsided the parts should be dressed with 25 per cent ichthyol ointment

Specific—Opinion is still divided on the use of antitoxin or antiserum Streptococci have very little of exotoxin and hence it is believed that specific antisera are of hardly any curative value Recently polyvalent antistreptococcal specific sera have been produced by firms of repute and the results of treatment with these sera are very encouraging Twenty c cm of the serum should be given subcutaneously as early in the disease as possible all precautions being duly taken to guard against anaphylaxis in sensitive subjects Injections are given every day the total quantity required to effect a cure hardly exceeds 150 c cm Calcium lactate 15 gr given per os three times is of a very doubtful efficacy In children blood transfusion has good effects *Specific*

Curative and prophylactic Recent chemotherapy of acute streptococcal infection by the sulphanilamide group of drugs by oral administration and by intramuscular injection is certainly a great advance in the treatment of acute erysipelas and has replaced the use of antiserum to a large extent To prevent recurrences a thorough investigation should be made to locate any latent septic focus or any other latent concurrent disease Autogenous vaccines are of great value in this particular field General tonic e g iron arsenic calcium and nourishing food and change to a salubrious climate constitute the three important adjuncts on which cure and prophylaxis are based The treatment has furthe advanced by the use of penicillin both by injections and local application The use of Penicillin in erysipelas is of undoubted value and should be started from the very onset *Prophylactic* *Penicilli*

(ii) Impetigo contagiosa

The commonest superficial lesion of the skin due to streptococci is *impetigo contagiosa* which is characterised by shallow ulcers surrounded by a halo of light erythema—(only seen in fair subjects) and covered with a light yellowish crust There is slight oozing of serum which is charged with streptococci The disease is auto inoc labl and contag o s to o l [illegible] *Erythema*

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tion from other children or even their ayahs and nurses and then passing it on to the mother The ulcers involve only the superficial layers of the epidermis and do not leave any scar on healing As a rule they are not very painful but somewhat tender on pressure There is always a certain amount of hyperpigmentation at the periphery of the healed area but this gradually fades out provided the lesions are not of very long standing

Sometimes impetigo in the adults is found to be caused by the staphylococci These are mostly on the limbs and begin at the mouths of the hair follicles and take a round or circinate shape These do not yield to ordinary treatment of impetigo contagiosa of streptococcal origin but respond well to the application of gentian violet lotion

Treatment Ammoniated mercury 5 to 10 gr to an ounce of lanoline or vaseline has acts as a specific Cure is established in 3 to 5 days The superficial crusts should be softened with olive oil and gently removed before a thin smear *Treatment*

of the ointment is applied night and morning. Induration and weeping which accompany some cases are best controlled with cold compresses of weak acriflavin lotion (1 in 3 to 5 thousand) or continuous application of calamine lotion. Repeated attacks at the same site produce tissue kataphylaxia, which condition requires general treatment with iron and arsenic tonics or cod liver oil. Vaccine therapy is hardly ever neccessary except in long standing cases in adults where lowered vitality retards healing. In a case of extensive lesions on the body or repeated attacks Sulphanilamide or Sulphathiazole internally has been found useful. These have also been used in the form of one or two per cent ointments and have proved to be very effective. The deep or veldt sore type of impetigo which is often found on the hands and feet, does not respond to treatment with ammoniated mercury, the lesions are deeper, crateriform with good deal of sanious discharge and are often confused with Naga sore. Cold compresses with 1 in 3,000 acriflavin lotion clear up the lesions in about a week or 10 days. Autovaccine is of proved curative value. In severe cases of streptococcic infection with general symptoms, fever, prostration etc. penicillin treatment both by injection and local spray has been found very useful giving prompt relief of symptoms and a rapid cure.

(iii) Ecthyma

This condition is very similar to impetigo, but the infection extends more deeply in the skin and involves the corium. It usually begins as a vesicle or vesico pustule which enlarges fairly rapidly and ulcerates with formation of a thick crust adherent at its edges to the skin. Lesions are usually multiple and in some instances are ushered in with fever and malaise. There may be a good deal of pain and tenderness owing to its deeper situation and the induraion of the tissues. When the crust is removed, a saucer shaped ulcer with a raw base and elevated edges is revealed. These ulcers are auto inoculable and leave pigmented or depigmented scars on healing.

Treatment. The crusts should be removed by soaking with warm olive oil, no soap and water should be used subsequently. Locally, cold compress with 1 in 3000 acriflavin lotion during the day, weak ammoniated mercury ointment (5 gr. to 1 oz.) or borovaseline at night yield the best results. In extensive cases the patient should be kept in bed and treated with iron and arsenic tonics or calcium lactate 10 gr. and parathyroid 1/10 gr. twice daily on an empty stomach. Every attention should be paid to improving the general health, especially in growing children who respond well to cod liver oil, malt or ostelin. Sunlight and ultraviolet radiation are valuable adjuvants in delicate subjects. Autogenous vaccine is of proved curative value but disappointing results are inevitable if too much faith is pinned on the injections alone. All focal infections should be carefully sought for and treated thoroughly.

(3) Diphtheria

Infection of the skin by *Corynebacterium diphtheriæ* occurs as an acute primary condition or as a secondary infection on pre existing sores and abrasion of the skin. The cutaneous involvement may be independent of infection of the mucous membranes. The characteristic lesions shew ulcers with swollen edges and a false membrane of a greyish colour covering the base. *Constitutional* symptoms are fairly severe and out of proportion to the number of ulcers which are rarely multiple especially in the primary type of cases. The disease is highly

contagious and usually more than one inmate is affected in boarding schools or army barracks Impairment of the cardiac function sets in early and the case often terminates fatally, if specific treatment is delayed too long

Treatment Injection of the antitoxin in full doses (50 000 units) near the lesion gives uniformly successful results Local dressing with lint soaked with ... ons should be repeated till constitutional ... uarantine are essential for preventing ... Sulphonamides are of no value but ... tive

(4) Anthrax (Malignant Pustule)

Etiology

The disease is caused by a spore forming bacillus *Bacillus anthracis* and is commonly seen in people dealing in hides cattle farmers, wool sorters tanners, butchers and stable grooms A few cases have been reported to have occurred from the use of cheap pony hair shaving brushes It is an acute and generally fatal disease with accompanying suppurative adenitis and grave constitutional ... A typical lesion is generally seen after the infection The inflamma... rounded by intense infiltration and ... ccurs *early* exposing a dark brown ... ides resting on a red swollen and ... or sanguineous and is full of ... ise œdema of the tissues spreads other bullæ develop accompanied by high temperature and grave constitutional symptoms The regional lymph glands suppurate and septicæmia with metastatic abscesses in vital organs precipitate a fatal termination In milder cases the constitutional symptoms are slight and the gangrenous tissue sloughs out leaving a clean ulcer which heals by formation of granulation tissue

Treatment—Immediate and wide excision is urgently indicated When the face is involved multiple incisions and cauterising with phenol or tincture of iodine may be substituted for wide excision which causes marked disfigurement Antianthrax serum should be given early with an initial dose of 100 c cm The dose is repeated till the fever subsides Injection of the serum at the site of the lesion is recommended and sometimes yields good results Normal bovine serum which has a certain amount of antibodies against anthrax normally present may also be used when antianthrax serum is not available Penicillin in large doses administered from the start has been found to be beneficial Sulphadiazyne is also useful

All linen clothes and utensils should be sterilised every day in the autoclave at a temperature of 120°C The soiled dressings should be burnt at once

(5) Glanders (Equina, Farcy)

Glanders

The disease is caused by infection with Actinobacillus mallei and is commonly seen in grooms veterinarians and cattlemen in either an acute or chronic form The skin of the face and the nasal mucous membranes are commonly affected A typical skin lesion begins as an inflammed papule or vesicle which rapidly becomes nodular and then pustular and ulcerated The ulcers are *irregular* excavated with undermined edges and the base is covered with purulent or sanguineous discharge In the course of a few days or weeks secondary nodules appear along the lymphatics these break down and result in confluent sloughing

ulcerating lesions involving extensive areas of the skin Infection of the nasal mucous membrane is characterised by a preliminary catarrh and epistaxis followed in a few days or weeks by extensive ulceration and sloughing with purulent discharge loaded with bacilli In severe cases the temperature ranges high and a fatal termination is heralded by asthenic diarrhoea and involvement of the intestines Constitutional symptoms are less severe in chronic cases but a fatal termination from intercurrent diseases nephritis and general exhaustion is almost the rule

Treatment—Immediate excision and curettage followed by cauterising with phenol is the most important measure to save the patient Injection of the antitoxin Mallein in 1 to 2 c cm doses is of considerable value especially in chronic cases which have to be treated more or less symptomatically in other respects

Segregation and precautions regarding sterlisation of linen utensils etc are of great importance in prevention of the disease which fortunately has become quite rare now a days

(6) Tuberculosis of the Skin

The lesions produced by *Mycobacterium tuberculosis are* either primary or secondary to pre existing lesions due to various causes Whatever be the character

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e criterion of

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material and upon the result on of tissues removed from the affected areas Evidence of tuberculous lesions elsewhere in the body and reacion to tuberculin are taken as corroborative of histological diagnosis The lesions are clinically classified as follows —*Localised forms*— (i) Lupus vulgaris tuberculosis (iv) Scrofuloderma (ii) Lichen scrofulosorum (iii) or Bazin s disease (v) Sarcoid

(i) Localised forms

(*a*) *Lupus vulgaris*—The lesion consists of very small minute nodules translucent in colour and deeply embedded in the infiltrated true skin and thereby giving rise to reddish brown patches which heal in the centre with production of deep depigmented scars and spread diffusely at ... the lesion for an indefinite period of time On diascopic

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elevated above the level of the skin Adherent ... ecially at the margins The disease causes wide destruction of the tissues and leads to very ugly deformities contractures and ectropion There are two clinical types of lupus vulgaris namely atrophic and hypertrophic both types may set in acutely and in rare instances in more than one area at the same time with a fair amount of constitutional disturbance, this is especially noticed when there are active foci of systemic infection as well

The face particularly the nose is most frequently affected although the lesions may appear on any part of the body including the mucous membranes

In the atrophic type of the disease the nodules undergo spontaneous involution

and ultimately disappear, leaving thin scaly atrophic and depigmented scars On the other hand healing may not take place and the margins then assume a gyrate or serpiginous outline and continue to spread with formation of minute fresh nodules

The hypertrophic form is characterised by hard thick rough and depigmented cicatrices which are almost like keloids In the genital region ankles and dorsum of the feet the lesions often become papillomatous or even verrucose in character with a fair amount of exudation and formation of crusts Lupus vulgaris like all other tuberculous diseases is slowly progressive and its chronic course may extend over many years with periods of intermission and exacerbation

(*b*) *Ulcerative type*—This disease is almost always secondary to active tuberculosis of the internal organs and attacks the contiguous skin of the mouth nose anus urethra and vulva During the early stages small yellow miliary tubercles form on the skin and these break down in the course of a couple of weeks into oval or rounded granulating sluggish and painless open ulcers The lesions are comparatively superficial the edges are soft and irregular and the bases are raw uneven and sometimes purulent Formation of thin yellowish crusts is not very rare In rare instances ulcerative tuberculosis may be superimposed on pre existing lesions of the skin like simple injuries and impetigo This type is always due to localised infection from outside the site of predilection being the soles of the feet backs of th hands fingers and buttocks *Ulcerative*

(*c*) *Verrucose type*—The lesion begins as a group of small wart like papules which increase in number and coalesce to form brownish or reddish coloured oval patches There is a marked hypertrophy of the horny layer giving it a papillomatous appearance and the surface may appear as ploughed up and fissured The margin of the patches is dark red and is accompanied with fair amount of exudation or even suppuration and crusting Patches are usually single and occur on the exposed parts of the body following contact with infected materials especially tuberculous carcases In children the disease is often seen on the buttocks knees and thighs as they are in the habit of pulling themselves along the floor and thus come in contact with infected sputum In people walking bare foot the disease is commonly seen on the soles Sometimes vegetative outgrowths appear at the periphery where e tension takes place by coalescence of contiguous patches The disease runs a very chronic course spontaneous recovery occasionally takes place leaving thin depigmented scars at the affected areas *Verruca necrogenica* or post mortem wart is another type of verrucose tuberculous lesion and occurs on the dorsal surface of the thumb or fingers particularly on or near knuckles and interphalangeal joints they generally appear at the site of some previous injury or abrasion The lesions consist of pea or bean sized papular indurated warty outgrowths which are red or whitish in colour and always keratotic. Extension occurs by peripheral spread but they hardly ever break down into open ulcers Sometimes they disappear spontaneously leaving practically no scars Verruca necrogenica is very rarely followed or accompanied by generalised tuberculosis Occasionally these warty lesions are infected secondarily by streptococci or staphylococci with ensuing erysipelas or septicaemia The disease almost exclusively affects butchers packing house employees pathologists anatomists and dissecting room attendants *Verruca necrogenica*

(*d*) *Scrofuloderma*—The involvement of the skin is by direct extension of the tuberculous disease from glands and lymphatic nodes or subjacent bones The lesions are in reality in the mouths of sinuses leading to the caseating or *Scrofuloderm*

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Treatment—Immediate excision and curettage followed by cauterising with phenol is the most important measure to save the patient Injection of the antitoxin, Mallein, in 1 to 2 c cm. doses is of considerable value especially in chronic cases which have to be treated more or less symptomatically in other respects

Segregation and precautions regarding sterlisation of linen, utensils etc, are of great importance in prevention of the disease which, fortunately, has become quite rare now a days

(6) Tuberculosis of the Skin

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material and upon the results of animal inoculation with emulsion of [illegible] removed from the affected areas Evidence of tuberculous lesions elsewhere in the body and reacion to tuberculin are taken as corroborative of histological diagnosis The lesions are clinically classified as follows —*Localised forms*—(i) Lupus vulgaris, (ii) Ulcerative tuberculosis, (iii) Verrucose tuberculosis (iv) Scrofulodermia *Exanthematic forms*—(i) Miliary tuberculosis (ii) Lichen scrofulosorum, (iii) Papulonecrotic type, (iv) Erythema induratum or Bazin's disease (v) Sarcoid of Darier, Roussey and Boeck

(i) Localised forms

(a) *Lupus vulgaris*—The lesion consists of very small minute nodules translucent in colour and deeply embedded in the infiltrated true skin, and thereby giving rise to reddish brown patches which heal in the centre with production of deep depigmented scars and spread diffusely at the other parts of the lesion for an indefinite period of time On diascopic examination the active portions of the lesion can be seen to be composed of deep-seated granulation tissue with characteristic 'apple jelly' colour Fairly large plaques are formed by coalescence and development of new nodules and these may be elevated above the level of the skin Adherent scales are frequently seen especially at the margins The disease causes wide destruction of the tissues and leads to very ugly deformities contractures and ectropion There are *two clinical types* of lupus vulg [illegible] types may set in acutely and in [illegible] time with a fair amount of co[illegible] when there are active foci of [illegible]

The face [illegible]*ted although* the lesions may appear on any part of the body including the mucous membranes

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The hypertrophic form is characterised by hard thick rough and depigmented cicatrices which are almost like keloids In the genital region ankles and dorsum of the feet the lesions often become papillomatous or even verrucose in character with a fair amount of exudation and formation of crusts Lupus vulgaris like all other tuberculous diseases is slowly progressive and its chronic course may extend over many years with periods of intermission and exacerbation

(*b*) *Ulcerative type*—This disease is almost always secondary to active tuberculosis of the internal organs and attacks the contiguous skin of the mouth nose anus urethra and vulva During the early stages small yellow miliary tubercles form on the skin and these break down in the course of a couple of weeks into oval or rounded granulating sluggish and painless open ulcers The lesions are comparatively superficial the edges are soft and irregular and the bases are raw uneven and sometimes purulent Formation of thin yellowish crusts is not very rare In rare instances ulcerative tuberculosis may be superimposed on pre existing lesions of the skin like simple injuries and impetigo This type is always due to localised infection from outside the site of predilection being the soles of the feet backs of the hands fingers and buttocks *Ulcerative*

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(*d*) *Scrofuloderma*—The involvement of the skin is by direct extension of the tuberculous disease from glands and lymphatic nodes or subjacent bones The lesions are in reality in the mouths of sinuses leading to the caseating or *Scrofuloderm*

suppurating primary lesion There is almost continuous discharge of purulent matter from these sinuses the walls of which are reddish, granular and bleed easily Extensive ulcers are formed when several superficial sinuses run into each other The subjective symptoms are trivial and constitutional disturbances are very slight or entirely absent The disease often persists for years and in a large number of cases spontaneous recovery takes place with formation of rough thick cord like cicatrices resembling a keloid Over 80 per cent of the patients are children and young adults

Treatment General hygienic measures are of great importance The patient should have plenty of good nourishing food plainly but agreeably cooked Fresh air, sunlight and change to a suitable climate are strongly recommended General irradiation with ultra violet light for hours at a time has proved to be of definite value

Internally, cod liver oil when tolerated should be given in full doses Preparations of vitamin D, *e g*, Ostelin, Irradol, Radiostoleum, etc., are also of proved benefit Hypophosphites and lactate of calcium should be given in 10 gr doses with the two principal meals

Best treatment is with calciferol (Vitamin D_2) which is one of the radiation products of ergosterol Drisdol (a preparation of Vitamin D_2 dissolved in propylene glycol) in dosage of 50 000 units in a capsule is given after each meal If signs of intolerance occur reduce dose to two capsules Kidney disease and arteriosclerosis are contraindications Treatment has to be continued for 9 to 10 months or more Lesions may be temporarily aggravated during first three or four weeks of treatment

Toxic symptoms such as weakness, anorexia, dizziness, joint pains may be so severe that treatment may have to be discontinued

During the course of treatment good nourishing diet with vitamins and excellent hygienic conditions should be maintained Rest fresh air and sunlight should be insured Ultraviolet radiation therapy by exposure to the sun or carbon arc lamp or quartz mercury lamp is useful

Streptomycin may be combined with calciferol treatment in fact it is advisable to initiate treatment with combined therapy Streptomycin 0 5 gm is given intramuscularly twice daily combined with 1,50 000 units of calciferol daily The patient should be in hospital and the treatment should be continued eight weeks Streptomycin in doses of 1 0 gm daily does not give rise to toxic effects but if these do occur it should be discontinued For scrofuloderma deep X—ray therapy is advisable Penicillin may be necessary for secondary infection Surgical excision may be necessary

(ii) Exanthematic Form

(*a*) *Miliary tuberculosis*—*This rare form of skin tuberculosis is nearly* always associated with systemic infection and is characterised by an acute generalised eruption of small brownish red papules which break down early and form indolent ulcers

Localised forms are sometimes seen affecting the skin over softening tuberculous glands *The bacilli reach the skin as minute emboli through the* blood stream

(*b*) *Lichen scrofulosorum*—The lesions consist of groups of minute, keratotic follicular papules of light reddish brown colour scattered over the trunk or extremities It persists for years causing no subjective symptoms *Occasionally spontaneous recovery followed by recurrences are noticed*

(c) *Papulo necrotic type (also known as acnitis folliclis acne scrofulo sorum)* —The lesions generally appear in successive crops on the extensor aspects of the extremities face and trunk and are characterised by small firm discrete follicular papules which undergo necrosis in the centre and heal spontaneousl leaving deep pitted scars Children and young adults with active systemic tuberculosis are usually affected

(d) *Erythema induratum* —The disease is characterised by symmetrical deep seated indurated nodular formations about the subcutaneous vessels of the lower legs and is almost exclusively found in young women with glandular tuberculosis

(e) *Sarcoid*—(i) *Sarcoid of Darier and Roussey* The lesions are found on the extensor surfaces of the lower extremeties and are characterised by painless oval or rounded subcutaneous nodules which do not tend to break down or ulcerate Development of these nodular formations is slow and after persist ing for several months they undergo spontaneous involution Like erythema induratum the disease almost exclusively affects young women who show a strong positive reaction to tuberculin *Sarcoid*

(ii) *Boeck s sarcoid* The lesion consists of multiple nodular groups of superficial granulomatous infiltrations firm and elastic to palpation but without any tendency to break down and ulcerate The entire cutis is affected the epidermis remaining almost normal The surface is covered by a fine net work of capillaries which is more apparent in the case of a fully developed sarcoid than in the early stages Evolution is generally slow and the nodules may take months to attain a certain size Spontaneous recovery generally takes place although it may be delayed as long as a couple of years or so The face is the site of predilection but the other parts of the body may also be involved The disease is essentially of a benign nature and causes no symptoms Its relation ship to tuberculosis is doubtful

Treatment In view of the fact that exanthematic types of cutaneous tuberculosis is almost always associated with active systemic infect on the importance of general hygienic and dietetic measures cannot be too strongly stressed Fresh open air life good nourishing food sun baths or general ultra violet irradiation are necessities in spite of the tendency of this group of diseases to spontaneous recovery In the majority of instances treatment of the active systemic focus p events recurrences and leads to a permanent cure Cod liver oil and preparations of Vitamin D in full doses are recommended for every case irrespective of the clinical type of lesions and this may be combined with hypophosphite of calcium in 10 gr doses three times a day

(7) Tropical Ulcer or Naga Sore

The disease is characterised by single or multiple round or oval ulcers on the exposed parts of the body chiefly the legs and occurs in epidemic form amongst indigent labourers in Terai areas during the damp humid monsoon months The cases begin in May and increase during August September and October and gradually fall in December The lesions begin as small inflammatory papules which rapidly form into vesicles rupture and progress into ulcers Individual lesions vary somewhat in size and may be as large as 4 inches across the edges are elevated undermined and smooth or ragged with an inflamed halo around them the base is depressed granulomatous and sometimes covered with a false membrane Satellite ulcers may develop by auto-inoculation near the original lesion or on other parts of the body There is a thick glairy mucoid *Naga Ulcer*

and shows a certain amount of familial tendency in its occurrence Some subjects seem to have a predisposition and suffer with repeated attacks of herpes in approximately the same situation Such recurrences may follow intercourse, menstruation and intake of alcohol, spices, etc The contents of the vesicles are at first serous but become sero-purulent in a couple of days or so The walls of the vesicles are rather tough so that spontaneous early rupture does not occur Involution sets in about a week after the appearance of the vesicles, some of which rupture and heal by formation of yellowish crusts while others get dry and drop off in about a fortnight's time There is no residual scarring except when there is secondary suppurative infection The cause of the disease is a filtrable virus of low virulence and having a saprophytic existence on the mucous membranes under healthy conditions

Treatment—All possible sources of reflex irritation should be carefully looked for and removed Locally, in the eruptive stage, a cold compress with 2 per cent alum acetate solution is very useful Painting the area with spirits of camphor and alcohol followed by dusting freely with zinc and starch dusting powder or powdered alum relieves the pain and burning A thick coating of surgical collodion which is renewed every day is of value in preventing rupture and secondary infection of the vesicles Lesions at the angles of the mouth can be touched up with a caustic pencil and dressed dry with talcum powder In the genital region, especially on the apposing mucous surfaces of the vulva strict cleanliness is essential The area should be swabbed with hydrogen peroxide and dusted with 5 per cent aristol dusting powder (aristol 20 gr, zinc oxide and starch 4 oz of each) three times a day Recurrent cases require investigation into presence of focal sepsis in the teeth, tonsils, upper respiratory passages, bowels or pelvis

(3) Herpes Zoster

The lesions consist of groups of vesicles on an erythematous base and occur along the distribution of the fibres of nerves originating from one or more posterior root ganglia The onset is acute and fairly rapid and is in many cases heralded by malaise, fever and persistent neuralgic pain The cause of the disease is a filtrable virus of the same category as chicken pox and people coming in close contact with a person affected with herpes zoster have been known to have developed chicken pox after an incubation period of fourteen to sixteen days Individual lesions have the same character as *herpes simplex*, but are more intense and extensive and large patches consisting of a dozen or more vesicles appear in successive crops on the same side of the body The site of appearance of herpes zoster may remain hyperæsthetic for months after an attack The most serious sequel to herpes zoster of the face is affection of the cornea and the eyeball when the nasal branch of the ophthalmic division of the fifth nerve is involved

Treatment—It is advisable to give the patient a good purge with calomel or blue pill followed by saline cathartics the next day When the cornea is affected cold compresses with 2 per cent boric lotion are applied every 4 hours The eye should be examined frequently by an ophthalmologist for corneal ulcers. The skin lesions are best treated with thick layers of talcum powder and cotton wool dressing A hot water bag is very agreeable and relieves the neuralgic pain in mild cases Aspirin hypnotics of the barbituric acid series or even morphia may be necessary in severe cases

Specific treatment —Injections of the tissue filtrate is specific for this disease Intradermal injections are given every other day, 2 or 3 injections of 0 2 c cm each usually suffices It is hardly necessary to give more than 3 injections, but the full course should be given if complete cure is not effected The dose need not be increased more than 0 2 c cm In very acute cases the initial dose should be 0 1 c.cm After the 2nd injection the pain subsides and the lesions begin to dry up Complications are definitely lessened *Specific*

(4) Warty Growths (Verrucae)

These are papillomatous, circumscribed hypertrophic lesions, gray or black in colour, in which the prickle cell layer grows to enormous thickness as also does the horny layer Many of these have been proved to be infectious and auto inoculable, especially the juvenile variety which is caused by a specific filter able virus Any place on the skin may be affected, but on the scalp, face, lips *Verrucae* and eyelids they are commonly associated with seborrhœic affection Occurring on the soles of the feet, they render walking very painful and simulate callosities, but unlike them, warts also grow in areas not subjected to pressure. They are [illegible] smooth, slightly raised papular lesions, the sites of predilection being the forehead, cheeks nose, upper lip and backs of hands They are of normal colour of the skin *Seborrhœic or senile warts* are usually multiple, slightly raised, black, keratoses, and are found on seborrhœic types of skin showing senile atrophy with age These are usually covered with a greasy crust which on removal leaves a raw pulpy base Some are extremely irritable and are sites of subsequent development of basal-celled carcinoma *Verruca acuminata* or venereal warts are associated with gonorrhœa and occur as multiple small pointed projections which multiply rapidly and form a large vegetating bunch on the penis, about the anus on the mucous surface of the vulva and on the perineum Rarely, they are seen in the axillæ, the groins, umbilicus or clefts of the fingers They may grow to fairly large cauliflower like masses and are sometimes very fœtid owing to accumulation of the purulent discharge in the clefts between the filaments The colour is usually pale yellow or pinkish

Treatment —Removal by curettage or excision is the simplest and best treatment for sparse discrete lesions, care being taken thoroughly to cauterise the base with pure carbolic nitric or trichloracetic acid or 20 per cent silver *Local* nitrate to prevent recurrence Hæmorrhage, secondary infection and scarring are the principal disadvantages In extensive cases removal is not recommended Refrigeration with carbon dioxide snow yields very satisfactory results provided each group is taken up separately under the applicator and frozen for about a minute or longer The process is tedious and takes a very long time to establish a cure Electrolysis and radiotherapy, separately or in combination, give most satisfactory results in extensive venereal warts, but a preliminary excision under anæsthesia may be necessary in some cases to expose the base to the effects of treatment and thereby prevent recurrence Surgical diathermy is recommended especially for plantar warts but a single exposure to unfiltered X ray brings about cure in most cases All seborrhœic warts on senile atrophic skin should be examined histologically for signs of early malignancy and surgical treatment given accordingly.

Internal—Various treatments have been advocated from time to tim claiming success including auto suggestion, various medicated baths and applica tions X ray treatment is certainly beneficial under expert guidance Bismuth in the form of salicylate or metalic suspension has been found effective in case of small papillomatous warts The infective warts of the small soft variety yields best to the tissue filtrate injections as described in the section of filter passing virus diseases of the skin

(5) Pityriasis Rosea

This is a generalised eruption of the skin with pinkish scaly patches of various sizes and shapes The eruption as a rule is preceded by a single scaly patch the herald patch' frequently in the neck, flanks or thighs but it may appear on any part of the body A week or ten days after the appearance of the herald patch the general eruption breaks out, sometimes accompanied by mild constitutional symptoms such as slight fever enlargement of glands or pains in the joints, but these constitutional symptoms are often absent The individual lesion is rose pink, reddish and sometimes skin coloured scaly on the surface oval or circular in shape and varies in size from ¼" to 1" in diameter or larger When fully formed the border is raised and scaly the centre yellowish or skin coloured without any scales In some cases the onset is very acute and the eruptions look like an acute exanthem or acute seborrhic dermatitis, and it is very difficult to differentiate until the acute condition subsides and the typical rash develops in about a week s time Contiguous lesions often coalesce and form large plaques covered with fine branny scales A few cases complain of itching especially when they perspire, but otherwise subjective symptoms are absent and the patient maintain good general health

Total duration of the disease is short 5 8 weeks and spontaneous recovery takes place in majority of cases But the disease may continue for three or four months or longer Relapses are uncommon

Treatment—Patient should receive soothing application such as liniment of Calamine or Ichthyol lotion 2 per ... ific treatment with tissue filtrate injec ... In pityriasis rosea the final dilution c ... sue per 1 c cm of the saline *Injections are given every other day and the maximum* dose is generally 0 5 c c Six injections complete the course

6 Skin Affections Due to Physical and Chemical Agents

(1) Physical Agents

Heat light cold, pressure moisture and dryness effect the skin Constant moisture sodden the skin which becomes very liable to injury and infection The effects of cold light and heat are discussed below —

(1) *Effects of cold Frost Bite*—Intense cold causes freezing and necrosis of the cells including those of the blood vessels leading to thrombosis and necrosis of the frozen tissue This constitutes *frost bite* *It most often attacks fingers* and toes tip of the nose and the ear The affected parts become numb and white *On thowing*, the parts become oedematous and painful Later bullae appear and sloughs are formed

Treatment—The treatment consists in keeping the part absolutely clean and at rest It should be kept covered with sterile dressings and many layers of wool Massage and application of artificial heat are contraindicated If asepsis is preserved surgical interference can be avoided

Among sensitive subjects persistent exposure to mild degree of cold leads to a number conditions in which the essential histology is the same, but there is a difference of degree only The various conditions are grouped as *Perniosis* It consists in dilatation of minute vessels and small veins and constriction of arterioles In pronounced cases collections of leucocytes forming hyaline masses are found within the vessels

Chilblains (*Erythema pernio*)—These are dark red swollen areas intensely itching involving most commonly the fingers or toes which may occasionally ulcerate They are most common in young female adults anaemia and tuberculosis being predisposing causes *Chilblains*

Treatment—Painting the area with tincture of iodine or ichthyol, rubbing with ointments containing menthol methyl salicylas or iodine or the application of lead lotion are useful Warm gloves and stockings regular exercise washing in warm water and careful drying of hands constitute the prophylactic measures

Cod liver oil and thyroid siccum ¼ to ½ gr T D S throughout the winter are recommended

(ii) *Effects of heat and light sunlight* In the tropics the effects of heat of the sun are of importance, particularly for European residents whose skin is naturally deficient in the protective filter, namely melanin pigment The actual damage however is caused more by the ultraviolet than the heat rays and hence erythema sunburn and blistering of the skin is more intense at bathing beaches or in the open country where freedom from the dust and smoke common to towns and cities, allows almost unimpaired action of the ultraviolet rays The reaction varies a good deal according to the sensitiveness of the individual skin, blondes being more susceptible than brunettes Subjective symptoms may appear within a few minutes of the exposure or may be delayed as long as the next day The skin becomes intensely red and inflamed, there is a feeling of constant pain and burning there may be actual vesication single or multiple which in extreme cases, coalesce into a large bleb When the reaction subsides, the skin is left more pigmented, and this gives a certain amount of protection against subsequent burns from exposure In this way repeated exposures may induce sufficient pigmentation of the skin— tanning of the skin —to confer almost absolute immunity from solar dermatitis Aged persons however react somewhat differently owing to the loss of elasticity of the skin and may develop keratoses and depigmented spots *Effects of sunlight*

Treatment—Sooth[illegible] rmaceti ½ dr, white wax [illegible] ½ oz) should be applie[illegible] with ice or the part is co[illegible] l liquid paraffin and kept cold by gentle rubbing with ice *Local treatment*

Prophylaxis Exposed parts should be smeared with a cream containing quinine hydrochloride (2 per cent), bismuth oxycarbonate (5 per cent) or disodium naphthol sulphate (5 per cent) as these compounds absorb ultraviolet rays to a certain extent They offer no protection against prolonged exposure Black or red hats, veils and umbrellas offer good protection Anointing the body with heavy vegetable oils is practised by indigent people a protection *Prophylaxis*

Prickly Heat The affection begins in people who sweat rather profusely during summer months in the tropics and are in the habit of wearing too many tight fitting clothes The mouths of the sweat glands *are obstructed owing to* a sodden condition of the epithelium due to excessive perspiration and this produces sudaminal vesicles on the body and desquamation on the palms These sudaminæ

in the axillæ

Individual

prickly heat

They are extremely irritable and when abraded may develop into pustules which eventually lead to the formation of boils and abscesses When these vesicles are infected secondarily with staphylococci they appear white like sago grains In the axillæ these pustules generally attain fairly large size and are called *Pyosis mansoni* Persons subject to seborrhœa are more susceptible to prickly heat because the primary infection with the fungus causes obstruction of the mouths of the sweat glands and consequent irritation favours secondary infection with staphylococci

Treatment—The most important measures to check this excessive sweating are curtailing of vigorous physical exertions avoidance of heavy tight fitting clothes and hot spiced foods Intense irritation is best controlled by swabbing with calamine lotion or ammonia solution (1 dr of Scrubb s ammonia to a pint of cold water) and sprinkling with sulphur camphor dusting powder Talcum powder is recommended for sensitive skins because they tend to develop sulphur dermatitis The scalp must be treated with resorcin lotion at the same time as otherwise the local treatment of the skin will only give temporary relief

Prophylaxis The precautionary measures should be commenced before the humid pre monsoon season has set in and carried on until the rainy season is almost over Avoid over bathing and oversoaping, wear loose porous clothing devoid of bands of constriction and friction Brief sponging of skin with frequent puffpowdering with unscented talcum (U S P) is an useful preventive If this is not effective animal lipids such as lanolin or cholesterolized petrolatum may be useful *Sleeping in cool dry places such as air conditional rooms or working* in them is a preventive

Effects of heat are not only due to high temperature to which the skin is exposed but also due to exposure to the *sun light* *One common effect of sun* light is *Summer erruption of children*
erythematae papules vesicles and wee
(*fore arm hands* face neck and knee
produce this erruption are orange yellc
that the breakdown products of epidermis are responsible for the condition

Treatm nt—For prevention the skin should be protected from exposure to light When the condition is established it should be treated like eczema with calamina lotion zinc paste etc

(iii) *Xeroderma Pigmentosum* (Kaposi s disease) This is a rare congenital condition and tends to be familial although all the children of the same parents may not be affected It is a form of light sensivity due to some congenital debility of the skin The condition begins in early years of life usually *the first* or second year and the earliest manifestations are photophobia dryness of the skin and reddish brown pigmentary deposites almost indistinguishable from ordinary freekles *These early symptoms may disappear only to recur with*

greater severity on further exposure to direct sunlight, freckle like spots become permanent pigmented patches The next stage is the appearance of numerous dilated vessels (telangiectasis) in irregular patches which in time become atropic areas As the disease progresses small warty growths of hyperkeratosis in the form of warts begin to appear

The warty growths eventually degenerate into epitheliomata These malignant growths have a predilection for the neighbourhood of the mouth and the eyes

Treatment —The only treatment known so far is to keep the patients strictly away from the sun's rays and use some protective pelliative ointment containing quinine to the exposed parts of the body The eyes should be covered with coloured glasses and hats should be broad brimmed *Treatment*

Prognosis in this disease is bad, the poor subject usually dies in early youth and rarely reach adult life *Prognosis*

(iv) *Chronic Ultra violet Light Dermatitis*—It is possible that patients who undergo ultra violet light therapy may develop chronic dermatitis The condition is seldom seen because the treatment is not generally carried to that extent *Light derma*

(v) *X-Ray Dermatitis*—Acute X ray dermatitis may arise from a single excessive dose or from the correct doses with too short an interval between them, such as may arise from prolonged screening examinations The following table shows the degrees of acute X ray dermatitis as described by Macloed *Xxray Dermatitis*

Degrees of Acute X-Ray Dermatitis

	Symptoms	Erythema		Result
		Appears	Disappears	
Degree I	Erythema, slight itching slight burning	14th days	In a few days	Slight desquamation temporary fall of hair, no permanent damage
Degree II	Erythema, œdema, more itching, more burning	8th days	3 4 weeks	Desquamation slight atrophy telangiectases after many months, permanent loss of hair, pigmentation
Degree III	Bright erythema oedema, vesicles, bullae, superficial sloughing	5th 6th days	Many months	Atrophy, scarring, telangiectases, pigmentation, ulceration
Degree IV		2nd day	Remains	Intractable ulcer, very painful malignant disease

Treatment —Any soothing application, such as lotio calamina, lotio plumbi or zinc cream would be sufficient for mild cases For relieving itching any analgesic may be added, such as acid carbolic, menthol or benzocaine all 2% Severe degrees of x-ray burns will not recover by any application—surgical intervention may be only course open in these cases

Chronic X-Ray Dermatitis —It may develop as a result of frequent exposures to small doses as may happen accidentally among x ray workers The parts usually affected are backs of the hands and fingers The skin becoming atrophic and hairless The tendency to cracks and secondary infections increases very much Itching and burning sensation are felt The nails become opaque and brittle and infection of the surrounding tissues is apt to occur Later on Keratosis appear which may ulcerate or increase in size changing with squamous epitheliomata

The treatment is only palliative The hands should be protected and condition treated like ordinary eczema

(2) Chemical Agents

(i) *Dermatitis Medicamentosa* Local application *of apparently harmless* paints, plasters, liniments or ointments may set up most intensely acute dermatitis in some sensitive skins, the sequence of cause and effect being quite obvious both to the subject and the prescriber The commonest drugs which cause acute dermatitis *are of the nature of chemical irritants, the degree and intensity of the* reaction varies according to the nature of vascular response of the skin to external stimuli Hair dyes, lip sticks, nail paints, eyebrow pencils, depilatories and shaving creams have been active sources of acute dermatitis owing to the various chemicals incorporated therein *Some drugs taken internally also give rise to rashes.* For detail see Drug Rashes

The following commonly used drugs are liable to produce skin eruption —

Acetanilid, aconite amidopyrina, antipyrine, antitoxin, arsenic & arsenicals *aspirin, atabrin, atophan,* belladonna, *benzocaine,* bismuth, bromides, chloral, chloramide, cinchophen codeine, copaiba, cubeb, ephedrine, formalin gold, [illegible] extract mapharside resorcin, salicylates onamide, stilboestrol, B complex

ucing

Treatment —Discontinue the particular drug causing the irritation and apply cooling soothing lotions like liquid extract of hamamelis, cold cream or rosewater ointment The affected parts should be cleansed with olive oil or liquid paraffin, soap and water being avoided till the acute stage has passed off

Prophylaxis It is better to warn the patients to use all stimulating applications first on a small area of the affected part and watch its effects overnight Extensive inflammation can thus be avoided

(ii) *Dermatitis Artefacta* These are self inflicted injuries which might be *produced* (a) quite innocently from an obsession that the patient is infested with insects or (b) to deceive or (c) to excite sympathy The lesions caused from an abrasion are generally produced by nails and are present on the exposed parts of the body The patient is under the conviction that he is infested with insects which he must dig out to get relief and bits of skin are often brought to the physician as parts of the insects

Lesions caused with the intent to deceive are frequently met with amongst hysterical girls and women or in patients who are on the border line of insanity Amongst men it is found in those who want to shirk work or derive insurance benefit Beggars often present themselves with an artificial wound in order to excite sympathy.

As is expected, artificially produced lesions differ greatly in size, shape and depth according to the agents used to produce them They may consists of erythematous lesions, vesicular patches of bullous lesions with an inflammatory base or they may take the form of superficial ulcers or gangrene. A great variety of agents may be used from the simple crude sharp method of digging cut pieces of skin by nails or some instrument or snipping pieces with pair of scissors or burning with a match, hot iron or coal, to the use of caustics, acids, or some skin irritants as cantherides or turpentine

Diagnosis—As a rule artificial lesions are few in number and are found in easily accessible parts of the body, *e g*, antero external parts of the limbs, the face and sometimes in front of the body The characters of the lesions do not conform to any known lesions caused by a disease They tend to come out suddenly and at irregular times The lesions heal up readily when covered with any fixed dressings The type of the patients is also an aid to diagnosis They are mostly highly neurotic, hysterical girls, and have a furtive look when questioned *Diagnosis*

Treatment—It is inadvisable for
patient or the relatives unless he is ce
the lesions and the motive to produce
has enabled him confirm his diagnosis and discover the agent, it is better to promise the patient not to disclose the facts provided the patient gives the assurance not to repeat the process Very often the patient does it in order to get the redress of a wrong, real or imaginary, and the physician should get himself into the confidence of the patient and get the wrong redressed or convince her of her mistakes

But sometimes all the skill and resources of the physician are thwarted by the ingenuity and perseverenace of the patient In these cases the assistance of an intelligent nurse is very helpful and wherever possible the patient should be taken in as an in patient in the hospital The treatment of the actual lesions is easy and consists of mild non irritating antiseptic dressing and where necessary an occlusive dressings with a zinc paste

(iii) *Ergo Derm atoses or Occupational Dermatitis* Various chemicals employed in industries cause a chronic eczematous condition of the skin amongst the workers The initial damage to the protective horny layer of the skin is done by constant soaking of the hands in water It has been found that even distilled water which is acid and hypotonic, produces desiccation of the epithelial cells If it contains some inert salt in solution it may become concentrated and hypertonic from evaporation owing to body heat and lead to cedema of the cells The dermatitis is thus induced on a hypersensitive or damaged skin so that the substances which the worker may have handled before without any ill effects now cause intense inflammatory reaction Repeated and prolonged contact with these products produces charges in the epidermis and vascularity of the skin and may sometimes lead to hyperplasia of the epithelium, keratosis and carcinoma Barbers, washerwomen, workers in lime, paints and varnishes, photographers, bakers, jewellers, etc, all may develop occupational dermatitis and the diagnosis of this condition offers no great difficulty *Occupational dermatitis*

Treatment—In the acute stage symptomatic treatment is resorted to, the pain and irritation requiring suitable sedative local remedies more or less on the same lines as for acute inflammatory lesions due to other causes

Prophylaxis Whenever possible the source of irritation must be removed and the affected parts kept protected with a coating of olive oil or cold cream but when it concerns the vital question of a man s bread and butter, it is difficult to ask him to give up his occupation Ultraviolet radiation and intensive calcium therapy may prevent repeated extensive attacks

7. Disease Affecting the Texture of the Skin

A. Hypertrophies

(1) Hyperkeratosis of the Horny Layer, Ichthyosis

This disease which is hereditary and familial, is characterised by the entire surface of the body being covered with dry, shiny scales, dirty grayish or brown in colour, harsh to the feel and broken up into a 'harlequin' or 'fish scale' pattern by numerous furrows This parchment like condition is accompanied with loss of elasticity of the corium and defective development of the sebaceous and coil glands—*Ichthyosis neonatorum* Lanugo hairs are absent and the scalp is completely bald in extreme cases, indicating involvement of the corium Survival of such a child is of very short duration—*Ichthyosis gravis* If the disease starts *in utero*, still birth is almost always the rule The acquired disease usually appears within the first five years of life and is at first noticeable only during winter months, almost complete recovery occurring in summer The skin is very harsh and dry, the horny layer has a shiny appearance and is traversed by numerous shallow cracks and ridges There may be increased pigmentation generalised or localised, owing to correlated depression of suprarenal function—*Ichthyosis nigra* The distribution of the lesions is symmetrical with regular arborisations and formation of complex patterns Local manifestations may be exaggerated into heaped up, ... excrescenses on the skin—*Ichthyosis hy*... appear as pigmented linear verrucose ... extensive areas of deeper tissues on the face, trunk or extremities Onset of the disease is insidious and the progress generally slow without any marked improvement during summer months The mucous membranes are never involved

Treatment Local The general principles adopted are first to soften the harsh dry scales with bland non irritating oil followed by mild keratolytic ointments to induce exfoliation of scales and stimulate growth of healthy skin The patient should be encouraged to anoint himself every day with olive oil or cocoanut oil which should be rubbed in with gentle massage and friction preferably in the sun He is then given a tepid alkaline bath for about 15 minutes dried with a fost towel and salicylic acid ointment 30 gr to 1 oz in lanolin base is applied all over the affected area Other keratolytic agents of stronger action are rarely required

General Good food, cod liver oil and general hygienic measures are of importance Bowel infection, protozoal helminthic or bacterial is often found in these cases and shoul[illegible] ... cures a large percentage of cases and ... put to bed and kept at absolute re[illegible] ... lapse rate is

100 per minute for one week, ¼ to ½ gr twice daily will generally suffice to keep the pulse rate steady near about 100 Then thyroid is omitted altogether to bring the pulse rate back to normal After two weeks of rest thyroid medication may be repeated if necessary or the patient may be advised to take thyroid gr 1 at bed time every day while following his usual work, for two or three months Cure is generally established in about six weeks provided the physiological functions of the thyroid gland of the patient are not already thrown permanently out of balance by other systemic diseases e g, syphilis For infants and children intensive thyroid treatment is recommended with the same precautions about absolute rest as is the case of adults, a proportionate dose being given according to the age of the child Lichen spinulosus and milder degrees of keratosis follicularis do not require intensive thyroid treatment mild keratolytic ointments and paints generally establish a cure

(2) Corns

These are circumscribed areas of thickening due to overgrowth of horny epithelium caused by pressure or intermittent friction on one or more points Corns are mostly found on toes due to misfit or too tight shoes The corn or horny outgrowth is conical in shape the base being on the surface and the apex pressing on the subjacent soft tissues

(3) Callosities

They are hard circumscribed outgrowths of the horny layer over bony prominences such as the tips of the knuckles of the fingers and on the palms of the hands near the bases of the fingers Sometimes the callosities are occupational

Multiple corns and callosities are also associated with the hyperkeratosis due to vitamin A deficiency and the other symptoms of such a deficiency should be looked for In the deficiency conditions the corns are usually multiple and are found on the soles of the feet and the palms of the hands which are liable to friction or pressure

Treatment—In conditions of multiple corns and callosities due to deficiency of vitamins the administration of large doses of vitamins and general hygienic measures are essential The local treatment should be as follows *Vitamins*

Paring the corn down to the core and removing it with a sharp pointed bistoury affords instant relief Painting the corns with salicylic acid ½ dr, tincture cannabis indica ½ dr, collodion 1 oz for a week and then soaking in warm water brings out the entire corn with its core Prophylaxis in the way of soft felt pads kept over the sites of pressure by adhesive ointment is of value Sufferers must be warned that a too loose fit in shoes sometimes leaves the toes a good deal of freedom of movement in walking and thus induces growth of soft corns *Local Treatment*

(4) Porokeratosis

The disease is characterised by annular lesions with narrow elevated warty margins enclosing patches of slightly atrophied skin They begin as small warty excresences due to a chronic inflammation in the dermis and during evolution

the central atrophic skin becomes devoid of hair and sweating Extension always takes place peripherally The lesions are most pronounced on pressure and friction areas such as the hands and feet which are the sites of predilection of the disease Any part of the body may be affected including the buccal mucous membrane where it appears as a white thick cord, the epithelium of the ridge becoming macerated by the saliva The ætiology is not clearly understood although the disease is considered by some as being due to thyroid defect There is a tendency towards familial incidence Spontaneous involution may take place but, as a rule, the disease runs a chronic protracted course

Treatment —Specific treatment is unknown Locally keratolytic applications, such as salicylic acid pastes and plasters or pyrogallic acid may be tried Curetting is of temporary benefit Total excision or refrigeration may be useful X ray is worth trying Many cases are said to have been cured by the administration of large doses of vitamin-A 100,000 units per day of the vitamin in concentrated form is given for a prolonged period

(5) Psorospermosis Follicularis Vegetns or Darier's Disease

It is characterised by symmetrical patches of papular dirty black warts affecting the neck, shoulders face, the extremities, the front of the chest and the middle line of the back It may sometimes spread over the entire surface of the trunk buttocks, genitals axillæ gluteal crease, and behind the ears Earlier lesions commence in the hair follicles as hypertrophic papules with greasy brownish bla ce to form large patches of itchy and bleed readily Th red and often ulcerated sur ts The lips are some tim *s and superficial ulcera*tion of the tongue are not uncommonly met with The nail beds show hyperkeratosis with malformation of the nails themselves The palms and soles *may also show patches of horny thickening*

Treatment —The treatment is very unsatisfactory and though the disease is a very rare one, it runs a long protracted course, spontaneous involution being unknown Local sedatives and keratolytic ointments only afford temporary relief Astringent dusting powders have been used empirically without much benefit by may be well worth a *n found useful in some* day for many months

(6) Acanthosis Nigricans

A rare disease characterised by hyperpigmentation and a warty condition of the skin of the neck, axillæ, genitals, groins, inner aspects of the thighs *flexures of the elbows and knees, umbilicus and anus* The face and the entire surface of the body are sometimes affected The warty excrescences are very small and closely set and although the appearance gives an impression of a hard *rough surface*, the feel is quite soft and almost velvety to the touch Similar lesions are occasionally seen on mucous membranes which become sodden and degenerated Growth of hair and nails is markedly affected in extensive cases Two clinical types have been described —(1) The benign juvenile type which appears early in life and occurs as isolated patches of vegetations, single or multiple but never with extensive or severe involvement of the skin (2) The malignant type appears late in life and is commonly associated with the later

stages of carcinomata of the internal organs As a rule, they forebode a fatal termination within a short space of time Involvement of the chromaffin cells is the principal ætiological factor in the malignant type which is brought about by pressure of intra abdominal tumours on the suprarenals

Treatment —In the benign type of lesions, the best results are obtained by intensive local treatment with keratolytic ointments and plasters during the quiescent stage Resorcin ointment 30 gr to an ounce, salicylic acid ointment 1 dr to 1 oz, or 10 per cent salicylic acid plaster can be used with advantage For small areas of limited involvement, carbon dioxide snow applied for 45 to 60 seconds can be used at 2 or 3 days intervals In the malignant type early recognition and treatment is advised No treatment is of any merit either in the benign or malignant form

(7) Diffuse Type (Dermatolysis)

In this condition the skin and subcutaneous tissues are hypertrophic and loosely attached so that the skin hangs in folds The neck, shoulders, face, thighs and scalp are usually involved The skin is coarse, harsh and pigmented but the growth of hair and sweating are normal The amount of hypertrophy and degree of looseness varies somewhat in individual cases and although the disease is of a slowly progressive nature the growth is arrested after attaining a certain size The ætiology is unknown Except for the discomfort of the massive pendulous outgrowth the disease produces no symptoms *Diffuse areas*

Treatment —The treatment is surgical Excision is not usually followed by recurrence *Surgical*

(8) Circumscribed Type. Molluscum fibrosum

The lesions consist of single or multiple flat sessile or pedunculated tumour like formations of varying size in the corium which may be present at birth or may be appreciable at about the age of puberty A single growth may be very large and pendulous but multiple tumours vary a good deal in size The majority of these tumours originate in the perineurium or the interstitial tissue of the peripheral nerves and those that are placed deep in the subcutaneous tissue are *attached to the larger nerve trunks which are sometimes extremely painful owing* to the pressure of these growths The number of tumours may vary from half a dozen to several hundred and may present all the varied morphological appearances in the same individual *Von Recklinghausen's disease* has been described as a separate clinical entity which is characterised by formation of numerous sessile and pedunculated tumours and massive areas of dermatolysis accompanied by patchy hyperpigmentation of the skin The disease often runs in families and several members may be affected to varying degrees There are no special symptoms

Treatment is eminently unsatisfactory and surgical excision of individual pendulous growths is the only way of giving relief

ACQUIRED TYPE

It is a very rare condition and has been found to occur during the later months of gestation It consists of small tumour like growths of soft consistency, mostly pedunculated, and affecting the front of the chest and mammary region Spontaneous recovery takes place soon after child birth *Aquired type*

(9) Secondary, Keloid or Growing Scar

Under ordinary conditions the fibrotic process leading to formation of scars is arrested by strangulation of the newly formed blood vessels in a healing wound and there is left pigmented or depigmented partly elastic scars which are stationary If the formation of these new vascular twigs continues owing to abnormal response of the angioblasts the growth of fibrous tissue also continues giving rise to hard depigmented overgrowths with claw like processes extending well beyond the original site of injury The epidermis over the keloid is thinned out from pressure and has a smooth glossy appearance with telangiectatic margins the colour changes to brown in course of time and there may be a good deal of hyperaesthesia or actual neuritic pain owing to involvement of sensory nerves The lesions vary a good deal in size and distribution those occurring after burns or scalds being the most extensive and lead to contractures and disfigurement about the eyes or mouth They rarely involute spontaneously although the growth may be arrested after some time

Treatment —B ... and treated by combined surg ... t to X rays or radium

(10) Scleroderma

Hide bound skin The condition is characterised by hyperkeratosis of the epidermis along with thickening and loss of elasticity of the skin owing to formation of bands of fibrous tissue in the corium The distribution is usually regional although in extremely rare instances the whole body may be affected Generalised types of cases are slowly progressive and almost always fatal Strangulation of the cutaneous vessels by the constricting fibrous bands leads to extensive gangrene and sloughing of the skin sometimes secondary pyogenic infection supervenes followed by toxaemia Complete loss of elasticity of the whole of the skin greatly impedes freedom of movement of the chest in respiration and death may occur from secondary asphyxia

Localised scleroderma It is characterised by occurrence of circumscribed or diffuse hard smooth depigmented areas which are fairly adherent to the underlying soft tissues There may or may not be any discolouration around these lesions In the early stage of the onset the affected areas may be swollen and inflamed with excessive cornification but atrophy of the skin follows rapidly with ... in the corium On the palms and soles ... extension of the fingers and t ... *contraction* is probably scleroderma of the palmar fascia

This pathological change in some instances commences at the base of the little toe and leads to spontaneous amputation of the entire member—*ainhum*—by formation of constricting band of fibrous tissue The onset is insidious and the progress rather slow The fourth toe may in some rare instances be affected but involvement of all the toes has not been recorded Ainhum is less painful than sclerodactylia a few of the patients do not complain of any subjective symptoms at all except in the las ... toe becomes gangrenous before dropping off ... from acrosclerosis which is an atrophic ... symmetrical in distribution

Circumscribed patches of scleroderma with telangiectatic or purplish margin and atrophic centre are called *morphœa* They begin as bluish red macules

which soon change into depigmented hard, dry, inelastic patches with smooth surfaces The lesions may remain stationary or recover spontaneously The small guttate variety of morphœa is sometimes called white spot disease'—which is a misnomer

Treatment —
Every individual
laboratory for ar
infection Cases in which there is a good deal of hyperkeratosis respond to intensive thyroid treatment to a certain extent but so far there is no drug which is known to check the over productivity of the fibroblasts Fibrolysin may be given a trial in 1 c cm doses intramuscularly every other day for 17 doses Bi weekly injections of muscle extract preparations such as sarcolan' or 'padutin' have been found very useful in many cases Combined organotherapy with thyroid suprarenal and gonad extracts produces considerable improvement in about 15 per cent of cases Syrup ferri iodide in 15 min doses iron and arsenic tonics and cod liver oil are remedies of repute which sometimes cure by improving the general health of the patient *Treatment*

B—ATROPHIC LESIONS OF THE SKIN

(1) Macular Atrophy

It is a rare disease of unknown ætiology of young adolescence and usually commences as slightly reddish patches on the dorsum of the hands and the elbows These patches are slightly œdematous and scaly but almost level with the surface of the unaffected surrounding areas and smooth to the touch, so much so that they may escape notice at this stage The true skin is mainly involved the epidermis remaining unaffected in the earlier stages The distribution may be only local or symmetrical and regional This pathological condition is due to replacement of the elastic fibres in the corium by growth of hard inelastic fibrous tissue which strangles the sweat and sebaceous glands and hinders materially the nutritive lymphatic circulation in the epidermis and also the activity of the melanoblasts to a certain extent *Pathology*

DIFFUSE TYPE It is commonly associated with scleroderma but has no ætiological relationship with it Lesions first appear on the dorsum of the hands and feet and slowly spread upwards to the arms thighs chest and back The progressive involvement of the integument may be punctuated with periods of apparen improvement but complete involution never occurs *Diffuse type*

(2) Acrosclerosis

It is an atrophic condition of the skin arising almost always symmetrically Beginning in the hands or face, it simultaneously affects the hands feet and the face The process is one of shrinkage The face becomes masked as the mouth opening gets smaller the lips narrowed and the teeth protrude The phalanges of the fingers become curved the two distal phalanges become hard to touch, the finger tips become ulcerated and stellate scars appear Talengiectasis is common There may be narrowing of other orifices e g vaginal orifice There are vasomotor —
are also compl
patients are ad *Areas affecte*

D et H el n d

s of leucoderma Peas beans
Gram seeds soaked in water
Carrots are also beneficial on account of its rich pigment content

Prognosis is unfavourable in the melung and muco cutaneous types Cases of over five years standing do not respond to treatment owing to almost permanent loss of function of the melanoblasts

There are certain practical difficulties in the use of the Bouchi oil (1) Sometimes the oil produces intense redness burning and even vesication after a few applications and in susceptible persons the reaction may appear after a single application In such cases the local application of the Bouchi oil should be stopped and replaced by a soothing application such as calamine liniment several times every day until the redness and vesication subside When the skin is normal apply the oil again but diluted it with olive oil either 1 in 2 or 1 in 3 according to tolerance of the skin In susceptible persons it is sometimes impossible to us the oil at all even in higher dilutions

(2) In young children the diluted oil should be applied from the beginning

(3) To certain tender parts such as the muco cutaneous junction of the lips eyelids and external genitals the oil should be used diluted with olive oil

In persistent cases where the application of the Bouchi oil fails to produce any effect intracutaneous injection of sterile oil produce good results The method of treatment by injection is as follows The oil is sterilised in an autoclave and kept in a rubber capped phial for the injection The patch to be injected is carefully cleaned with alcohol and the oil is injected intradermally with an ordinary hypodermic syringe fitted with a fine needle The amount of oil in each injection is a single drop (between 0 05 and 0 1 c cm) The number of injections varies with the size of the depigmented patch small spots of 1 cm or so in diameter only need a single injection in the centre In large patches the injections are spaced about 1 cm or a little more apart until the whole area is covered Within two to three weeks formation of pigment can be noticed beginning at the site of the needle puncture from which point it spreads centrifugally When deposition of pigment ceases or the contiguous areas of new pigmentation have failed to coalesce a second if necessary a third course of injection can be given in the intermediate white patches until the whole area is normally pigmented once more If the patch to be treated is several inches in diameter and in consequence needs numerous injections to cover it completely it has been found better to give a few injections fairly wide apart in the first instance and to follow with intermediate injections a few days later than to try to cover the whole area at one sitting The reasons for this modification are that injections are followed by a good deal of pain and if many injections are given at one time the pain is very severe The injection of the oil is sometimes followed by a small focal ulcer which remains small if the injections are wide apart but if several of these ulcers were to occur in adjoining injection sites they might coalesce and form a relatively large lesion It should be noted that apart from the extra discomfort at the time and the subsequent scarring ulceration has no ill effects on the final result as the scar always becomes pigmented

Occupational leucoderma Workers in tanneries wearing acid cured rubber gloves frequently develop leucoderma on the area of the skin covered by the gloves and it is found that the antioxidant one of the ingredients going into the manu facture of the gloves is the cause of the occurrence of such leucoderma According

to the manufacturers the antioxidant is the monobenzyl ether of hydroquine containing a fraction of 1 per cent of unchanged hydroquinone as impurity It is a light tan coloured powder with an aromatic odor melting at 115° to 120°c and having specific gravity of 1 26

ACQUIRED SECONDARY Any ulcerative lesion of the skin leaves ... es the corium and consequently ... gree, lupus erythematosus, lupus ... yaws and granuloma inguinale, ... nasked to a certain extent by ... ulcerative lesions are the first ... of leprosy, advanced stage of leukæmia and syphilis in the late secondary and tertiary stages Treatment should be directed towards the underlying cause as leucoderma is only a symptom in these affections

(2) Chloasma or Dark Skin

Congenital Generalised dark colour of the skin can hardly be considered ... of the body ... sed chloasma ... nd is known ... skin almost ... the patch is the darkest and the edges fade into the general colouration of the skin After persisting till the 5th or 7th year of life mongolian spots disappear spontaneously Congenital flat moles when diffusely extensive may resemble chloasma but careful observation shows that they grow with age and are more sharply circumscribed without fading margins

Dark Skin

ACQUIRED PRIMARY Generalised darkening of the skin is seen in a very small percentage of cases after puberty owing to the recessive individual character becoming dominant Bronzing of the skin is sometimes noticed during gestation and in old age due to disturbance of the suprarenal function The ... cutaneous ... e chloasma ... tn Senile bronzing is usually slowly progressive in character and is sometimes associated with a low blood pressure

LOCALISED *Chloasma vulgaris* or the common type is seen on the malar prominences the bridge of the nose and the forehead The spots are usually oval or rounded in outline and the margins fade into the colour of the normal skin The colour varies light yellow to almost black several small patches often coalescing to form a fairly large one on the face There are no subjective symptoms Any part of the body may be affected including the mucous membranes in extensive cases The disease is more common in women in the early forties and is correlated with the retrograde changes of the climacteric suggesting abnormal physiological functions of the ovary and suprarenals

Chloasma vulgaris

Treatment Treatment consists of using bleaching lotions and creams which induce slow desquamation of the horny layer and shedding of the pigment particles along with it The general health should also be well looked after and fatigue and overstrain are better avoided Best results are obtained by combining local tr at

Treatment

s of thyroid suprarenal and gonads offering the following line of treatment have been found most

bismuth subnitrate 10 gr,
dark patches Salicylic aci
Internally, ext thyroid sicc 1/6 gr ext suprarenal sicc ¼ gr, Estrone and estrogenic hormones and ascorbic acid intravenously have been tried

ACQUIRED SECONDARY Localised patchy and diffuse hyper pigmentation of a secondary nature appears at sites of friction and irritation from diverse sources The most important physical agents are heat and sunlight the hyperpigmentation in such cases being preceded by erythema Mechanical pressure and friction of clothes, *e g*, wearing the 'dhoti and 'saree' round the waist pressure of truss pads, garters braces the back and front collar studs etc, produce dark patches at the sites of contact with the skin, cure is spontaneous though somewhat slow as soon as the cause of irritation is removed Trauma either mechanical or resulting from violent irritative lesions like scabies and prurigo leave the skin somewhat hyper pigmented, especially in subjects who are hypoadrenic in their endocrine balance Seborrhœic dermatitis also induces patches of chloasma on the forehead cheeks nose and face generally, and in some cases all over the body in hypoadrenic subjects Treatment of the primary cause brings the colour of the skin back to normal Intra abdominal tumours of a malignant nature Addison s disease and Graves s diseases cause generalised or diffuse chloasma the mucous membrane of the mouth and tongue also show black patches fairly early in the course of these diseases Rheumatoid arthritis and tertiary lesions of syphilis also cause hyper pigmentation of the skin

9. Erythematous Lesion of the Skin

(1) Erythemata

Simple transient erythema is produced by external agents like heat sunlight, chemical and mechanical irritants and they act by producing dilatation of the capillaries Spontaneous recovery is the rule as soon as the cause is removed The most important internal cause is psychic or emotional as is seen in blushing Permanent dilatation of the capillaries may follow the action of external agents over a long period in a subject whose capillary tone is poor Hypotonic condition of the capillaries may due either to toxic absorption from focal sepsis or to inherent hypo pituitary and hypo adrenic conditions Defective calcium metabolism is also an important ætiological factor The important clinical varieties are –

(1) Erythema rubra nasi or facial erythrodermia The nose cheeks forehead and the neck assume an unusually flushed appearance without any apparent cause there are usually no subjective symptoms Patients may show marked erythrodermia of the hypothenar eminences of one or both hands In a certain percentage of cases a very fine telangiectatic condition of the alae nasi and the cheeks is noticed

(2) Erythema ab igne This is caused by a permanent dilatation of the capillaries and arterioles induced by prolonged exposure to excessive heat It is almost exclusively seen in cold countries more often in women than in men and affects the anterior tibial region of both legs which are exposed to the radiant heat of stoves or ovens In the early stages the skin has a pink mottled appearance but with the onset of reticulated erythema of later stages a certain amount of

pigmentation supervenes, so that a patch may shew simultaneous variation from pale pink to purplish dark brown Too frequent use of the hot water bag may produce these vascular changes at the site of application

TREATMENT The first essential is to remove the cause Locally, cooling soothing lotions, *e g*, calamine lotion should be used as a continuous application For facial erythrodermia a 5 per cent ointment of disodium naphthol sulphonate should be used when going out in the sun Internally calcium lactate 10 gr with parathyroid 1/10 gr should be given twice daily on an empty stomach

(3) Erythema pernio or chilbains The papillary capillaries undergo marked dilatation with cold and the permeability of the endothelium is increased allowing exudation of serum in the papillary layer The exposed parts like the fingers, toes, ears and nose are usually affected some people being more susceptible than others Cold feet during winter months is the most important predisposing cause but undernourishment and defective calcium metabolism are no less important factors in producing the disease after exposure to moderate cold The affected areas are red sometimes bluish owing to venous engorgement swollen and extremely irritable but quite cool to the touch and often covered with sweat. There is good deal of pain and burning owing to the papillary œdema, which in extreme cases interferes with rest at night

TREATMENT *Local* The affected parts should be bathed in warm water 4 or 5 times a day and massaged gently with plain lanolin or simple ointments The feet should be kept dry and warm and exercised to improve the circulation Warm Goulard s lotion is useful in relieving the pain and burning The inner side of the socks should be well powdered with camphor and French chalk (camphor gr 30 to 1 oz of French chalk) before putting them on

Internal Calcium lactate 10 gr with parathyroid 1/10 gr should be given twice daily on an empty stomach Nicotinamide 50 mgm three times a day and calcium gluconate 2 0 gm three times daily may be given A diet of high vitamin contents and general tonics are recommended Local or general ultra violet radiation, when available brings about quick amelioration of symptoms

(2) Toxic Erythemas

formation Inflammatory changes may also occur in the corium The distribution of the lesions may be local general or universal in which last case the mucous membranes are also affected The extent and distribution vary a good deal the eruption itself being made up of pin head size red macules which are generally so closely set as to form fairly large irregular patches all over the body The trunk upper arms thighs and face are the sites of predilection with a tendency to involve the hair follicles Clinically some toxic erythematous rashes often bear a close resemblance to scarlet fever *(E scarlatiniforme)* or measles *(E morbilliforme)* but are not associated with fever or other general toxic symptoms Localised macular rashes may, in rare instances be ushered in with rigor, joint pains and fever of short duration and have to be differentiated from

Toxic Erythemas

filarial fever by the absence of lymphangitis local pain and tenderness *Recurrences are not very uncommon* a few cases showing definite periodicity in these attacks There is a feeling of heat and tension of the affected skin and desquamation of the surface epithelium sets in as soon as the erythema has subsided

Treatment During the attack the patient should be kept in bed and elimination aided by suitable aperients and diuretic *mixtures* *A complete* change of the diet is very helpful Locally frequent inunction with 0 5 per cent carbolised olive oil or calamine lotion with 10 per cent glycerine relieves the burning and tense feeling of the skin Internally calcium salts either singly or in combination with parathyroid can be used to tone up the fine arterioles and capillaries of the upper layers of the dermis

Recurrent cases require thorough investigation *regarding the presence of* latent focal sepsis in the tonsils teeth or bowels The urogenital tract may also harbour such foci especially in women The curative treatment has to be carried out according to the nature and site of the infection surgical interference may be necessary for apical abscesses septic tonsils or cervical erosions General tonics and change of climate are recommended when repeated attacks seriously undermine the health

(3) Erythema Multiforme

Acute As the name implies this disease is characterised by protean local lesions consisting of red macules papules plaques and vesicles generally of symmetrical distribution They usually start as small erythematous herald spots slightly raised above the skin surface which in the course of *24* hours enlarge into large papules or plaques the inflammatory process is often of great intensity so that large blebs filled with serous pustular or even hæmorrhagic exudate form within a few hours The papillary and sub papillary plexuses show a good deal of dilatation with exudation of serum and perivascular infiltration There is œdema of the cutis with accumulation of serum underneath the epidermis the *entire thickness of which may be lifted up to form the bleb* *leucorrhexis* or erythrorrhexis is seen in very acute cases The sites of predilection are sides of the neck and face the dorsal surfaces of the hands forearms feet and legs and in very exceptional cases the mucous membrane of the mouth is also affected The lesions are bright red in colour fading on pressure and gradually changing into a purplish tinge at the periphery The disease may be self limited lasting for a short time or it may be prolonged for months or even years Constitutional symptoms are generally absent except in cases with acute onset but pain and irritation are generally present at the site of the lesions The general health may [illegible] There is a certain amount [illegible] generally accepted view is [illegible] n from the gastro intestinal tract which may be derived either from bacterial infection of the intestinal mucosa *or from the end products of digestion of* animal food In the tropics chronic amoebiasis is an important factor The important clinical types are *erythema papulatum erythema tuberosum erythema bullosum erythema iris erythema marginatum*

Treatment During the attack the treatment is mainly symptomatic Patients should be kept in bed and have all physical exertions curtailed The diet should be light and plainly cooked and the animal *foods reduced to a minimum*

The kidneys should be well flushed with large drinks of water and the bowels stimulated with mild aperients All stimulating drinks and beverages are to be

tes
al
If
be

investigated

Local treat

Locally—The macular type reacts well to astringent lotion For bullous type *2 per cent ichthyol in* Lassar s paste dries up lesions On lips 2 per cent tannic acid in cold cream astringent mouth washes and local application of 1 per cent silver nitrate solution

General

Internally give salicylates and if a septic focus is present sulphonamide or antibiotics Intestinal antiseptics such as salol bile salts are given If symptoms of intestinal intoxication are present autohaemotherapy and autogenous vaccines may be useful

(4) Erythema Nodosum

Characters

It is characterised by painful oval or rounded raised bright pink coloured *nodules surrounded by a halo of erythema and is ushered in with malaise joint* pains and rise of temperature The evolution of these nodules in fairly rapid attaining full development in six to twenty four hours and after persisting for about three weeks they disappear spontaneously The extensor aspects of the extremities are mostly involved the lower more commonly than the upper The lesions are usually symmetrical in distribution few in number tense to the feel and shiny in appearance they are situated deep in the corium Occasionally a few are tender on pressure Retrogression is heralded by change in colour from bright red to darkish red and purple the consistency becomes soft and fluctuating almost simulating an abscess In exceptional cases the nodules keep on appearing in crops and the total duration of the disease is prolonged to several months The ætiological factor in a fair percentage of cases has been traced to streptococcal infection in the tonsils and teeth the disease is a fairly common complication of rheumatic fever and has also been found in association with malignant endocarditis of non rheumatic origin There is marked dilatation of the papillary and sub papillary plexus with oozing of serum accompanied by leucorrhexis and erythrorrhexis Some of the capillaries are embolised by streptococcal vegetations and there is aggregation of leucocytes around them

Treatment

Treatment During an attack the patient should be kept at rest in bed the bowels should be moved by suitable aperients whenever necessary and the kidneys flushed with drinks of plain water or other sweet drinks Internally an alkaline mixture containing 10 gr of natural salicylate of soda with double the dose of the bicarbonate is given three times a day Sodium salicylate Aspirin Sulphadiazine or penicillin may be tried Locally 10 per cent ichthyol ointment acts as a sedative and this may be alternated with application of plain calamine or Goulard s lotion during the day A thorough investigation into the presence of septic foci in the teeth and tonsils is of great importance in preventing a relapse *which is not very rare Autogenous streptococcal vaccine from these foci of* infection is of proved curative value Patients in run down or otherwise poor condition of health require iron arsenic and quinine tonics and codliver oil as an adjuvant to specific treatment

(5) Lupus Erythematosus

The disease is characterised by the occurrence of pink, infiltrated plaques covered by adherent scales which tend to spread at the margin and heal in the centre with formation of atrophic scars and telangiectases The lesions are quite superficial and do not ulcerate but are extremely persistent and slowly progressive in nature When the scales are removed, the follicles of the affected area appear dilated and some are filled with horny plugs These epithelial plugs are usually firmly adherent to the under surface of the scales Clinically two types are met with (i) the acute disseminated exanthematic type and (ii) the chronic circumscribed or localised type Multiple lesions may appear in both types of case the patches being of various configurations Coalescence of neighbouring lesions often takes place at their extending periphery thus involving extensive areas on the face, head and neck, hands, vulva and the perineum The mucous membrane of the mouth is also commonly affected

(i) *THE ACUTE DISSEMINATED TYPE* The lesions may appear suddenly without prodroma and are accompanied by high fever and general constitutional disturbances In a few instances the acute exacerbation may be superimposed upon the chronic circumscribed type No part of the body is exempt from affection although the palms and soles escape in the majority of cases Individual lesions may be nodular or vesicular in character and in very severe cases hæmorrhagic Crops of lesions appear at different parts of the body at the same time Some patches heal up spontaneously, while others develop into the circumscribed type of lesion The buccal mucous membrane is almost always affected Repeated attacks may ultimately lead to a fatal termination from pneumonia or pulmonary tuberculosis

(ii) *THE CHRONIC CIRCUMSCRIBED TYPE* The onset is insidious and is not accompanied with any symptoms Characteristic lesions consist of well defined dry pink or reddish patches varying in size from a pea to the size of the palm of the hand are covered with greyish adherent scales The sites of predilection are the flush areas of the cheeks and the bridge of the nose the mastoid area the lobes of the ears and the scalp and front of the chest On the face the distribution is often symmetrical on both cheeks with a narrow strip like lesion along the nose giving rise to the typical butterfly shaped patch The skin is only slightly infiltrated and the inflammatory changes are practically confined to the edges where extension of the lesion takes place Atrophic changes with depigmentation and scarring in the centre of a patch and telangiectasis or gun barren blue discoloration of the margin constitute the typical clinical picture The mucous membrane of the mouth is involved 25 per cent of cases, the lips eyelids and tongue are also affected On the scalp the patches are hairless harsh sclerosed and extremely irritable

The course of the disease is somewhat erratic but slowly progressive Spontaneous recovery occasionally takes place without any residual scarring but recurrence is almost always the rule The disease generally appears between the second and fourth decades of life and women are more often affected than men The principal ætiological factor is septic embolism of the fine capillary twigs in the papillæ derived from latent foci in the teeth tonsils or nasal sinuses

Treatment Acute cases are treated on general lines and each case has to be carefully investigated for latent focal sepsis especially in the teeth and tonsils All metabolic defects or circulatory derangements should be corrected Absolute rest and small fractional feeds of concentrated nutritious liquid diet are indicated

when constitutional symptoms are servere Elimination through the bowels and kidneys should receive attention Locally cooling soothing lotions are used as [illegible] olive [illegible] at [illegible] um [illegible] of distilled water) give the best results

The chronic circumscribed cases also merit a thorough investigation into latent septic foci which should be located and eradicated General hygienic measures are of importance The diet should not contain any hot spices or condiments and stimulating drinks particularly alcohol are forbidden Exposure to bright strong sunlight or extremes of heat and cold are harmful

Local Therapy Irritating applications should be avoided Carbon dioxide snow may be applied but it produces scarring and recurrence is common A 10 per cent bismuth oxychloride ointment may hasten involution Xray and ultraviolet ray may aggravate the disease and should be used with care Gold has a definite place in the treatment of localized type though permanent cure is not often obtained Gold sodium thiosulphate is used and treatment is started with small doses varying from 10—100 mg according to individual tolerence The drug is given in weekly intravenous injections in courses of 20 injections a month s rest being allowed between courses Careful watch should be kept over skin blood liver and kidneys to avoid exfoliative dermatitis albuminuria jaundice etc Bismuth may be useful in gold resistant cases It should be given intramuscularly in aqueous or oily suspension in courses of 12 injections with a rest interval of two weeks sulphonamides may be tried in gold and bismuth resistant cases

Local Thera

Gold Sodium Thiosulphat

Mucous membrane lesions are resistant to both gold and bismuth Local application of 5 per cent chromic acid are useful Nicotinic acid and chaulmoogra oil are sometimes effective In disseminated type hospitalisation in a dark room is essential Blood transfusions sulphonamides plasmochin cobra venom have been tried

10 Inflammatory Diseases of Doubtful Toxic Origin

(1) Lichen planus Primary

Primary The lesion is characterised by dry shiny purplish or violet coloured papular eruptions arranged in groups with a linear or annular distribution and affecting mostly the flexor aspects of the limbs the trunk face and neck The mucous membranes of the mouth vulva and the glans penis are also involved although the typical lesions are not often seen in these situations Each papule is polygonal in shape and occurring on the normal lines of cleavage of the skin exaggerates the harshness of the texture so that a group of papules seem to form mosaic patterns on a deeply furrowed skin The disease is sometimes acute in onset with slight constitutional symptoms and affects large areas on the thigh forearms lower portion of the back and abdomen In severe cases the affected skin becomes diffusely red and œdematous but very soon assumes a violet or lilac colour Small herald spots few in number may appear several weeks ahead either on the limbs or on the buccal mucous membrane Spontaneous recovery may take place after a few months leaving the skin deeply hyper pigmented or the disease may progress and affect other parts of the body Occasionally atrophy of the affected areas is met with A few patches very frequently persist as the localised chronic variety particularly on the shin areas The lesions are very irritable

Lichen plan

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Lichen plan

The chronic type is far commoner than acute and shows periodic exacerbations during which new spots appear and spread although the older lesions remain localised on the parts already affected After persisting for several months or even years spontaneous involution may take place A few cases are progressive in nature so that the lesions become hypertrophic Intense itching is the most outstanding subjective symptom although all the patches are not equally irritable Clinically the hypertrophic or verrucous type may show linear distribution along scratch marks—*lichen planus linearis* The affected skin may be atrophic so that the lesion closely resembles morphœa—*lichen planus atrophicus* The skin may be intensely red and congested—*lichen planus erythematosus* or show bullous formations—*lichen planus bullosus* and *multiforme* In very rare instances hæmorrhage occurs in the skin—*lichen planus hæmorrhagicus* The patches extend by coalescence of the papules The ætiology of the disease is unknown Acute onset sometimes follows nervous shock or excitement Focal infection of the teeth and tonsils plays a very important part The disease is most frequent during active adult life, but children are not totally immune The changes in the skin consist of a sharply defined infiltration of the papillary and subpapillary layer with connective tissue cells extending as far down as the region of the coil glands The papillæ are enlarged and œdematous and the papillary capillaries dilated The horny layer is thickened and rete shows a certain ammount of hypertrophic changes

Treatment General The patient should be kept on good nourishing and plainly cooked food and encouraged to lead a hygienic outdoor life as far as possible All sources of mental worry and anxiety should be carefully avoided The ... h these channels is of in ... ed in almost every case ... presence of septic foci ... undertaken where laboratory facilities are available Correlated ... conditions should be determined and the source eliminated

Internal Preparations of mercury arsenic or bismuth give the best results That bichloride or biniodide of mercury may be given intramuscularly in 1/12 to 1/6 gr doses suspended in olive oil The patient receives one injection every day for 12 consecutive days with good results especially in acute cases chronic cases often require two or three courses of injections at 6 or 8 weeks intervals all prec ... mulative effects of mercurial salts ... in ½ to 2 dr doses twice daily is also ... jections biweekly or Neosalvarsan weekly often give very satisfactory results Bismuth in the form of oily suspension of the metal or as bismuth salicylate solution in 2 to 3 gr doses given intramuscularly are also useful

Local The acute cases require soothing antipruritic applications *e g*, liniment calamine with 3 to 5 min of phenol added to each ounce or ichthyol lotion 10 to 20 per cent Chronic hypertrophic verrucose types should be first cauterised with 5 to 10 per cent solution of liquor potassi followed by application of 5 per cent salicylic acid ointment Chrysarobin ointment can also be used Lichen paint of the School Pharmacopœia offers a good combination of antipruritic and keratolytic agents which is painted on with a brush night and morning Raw coal tar is also value An efficient combination for chronic hypertrophied lesions is is follows —Menthol 1½ dr thymol 2 dr chloral hydrate 1 dr chloroform and oil of eucalyptus 2 oz oil gaultheriæ 4 dr alcohol up to 8 oz

Lesions on the buccal or vulval mucous membranes are best treated with 5 per cent lactic acid or 0 5 per cent chromic acid Ultraviolet therapy may be used with advantage to relieve the itching of the skin X ray treatment has been recommended in fractional doses at weekly intervals and complete involution usually occurs in about two months time

Secondary lichen It occurs at sites of old irritative lesions of the skin such as ringworm sebo rheic and chronic allergic dermatitis The condition may sometimes be brought about or exaggerated by too frequent use of strong irritant drugs and keratolytic agents which exert a stimulating effect on the rete accompanied by inflammatory vascular changes in the superficial layer of the corium Treatment consists of removing the cause of irritation and use of milder keratolytic agents such as salicylic acid ointment 15 to 20 gr to an ounce to which may be added liq picis carbonis ½ dr and menthol 5 to 10 gr Chronic cases with obstinate patches require X ray treatment *Secondary Lichen Planus*

(2) Lichen Nitidus

It is characterised by shiny flat flesh or pink coloured papules which are always discrete and slowly progressive in nature and produce no subjective symptoms The commonest site of occurrence is the genitals although the breasts thighs arms and the lower abdomen may be also be affected The lesions involve the mouths of the pilo sebaceous glands and are sometimes slightly scaly Spread of the disease may be arrested for sometime and spontaneous recovery is not very uncommon The disease itself is often overlooked because of the absence of irritation which distinguishes this condition from lichen planus The ætiology is unknown some authorities believe that there is some relationship to tuberculosis

Treatment It is rather unsatisfactory *Local* treatment with an ointment containing resorcin and salicylic acid (20 gr of each in an ounce of lanolin base) gives the best results when continued for sometime Internally iodine in gradually increasing doses has proved to be of some value Stubborn cases should receive a trial with intravenous injections of gold sodium thiosulphate

(3) Psoriasis

It is a chronic recurrent inflammatory disease characterised by circumscribed patches of erythematous lesions with dry silvery scaling surface It generally affects the scalp the ears the extensor aspects of the extremities and the sacral region. The diagnostic features of the disease are the presence of micaceous sometimes laminated scales which are loose at the periphery and more or less firmly adherent at the centre of a patch when these scales are removed the underlying skin is found to be markedly erythematous with points of bleeding from the tips of the papillæ The onset is usually insidious beginning in the scalp where it is often diagnosed as dandruff in the earlier stage Initial lesions may appear at the common sites of predilection or on any other part of the body as small guttate erythematous papules covered with fine silvery scales the face palms and soles generally escape Spread of the disease is generally slow the individual lesions enlarge by peripheral extension and coalescence of contiguous patches often gives rise to gyrate patterns Involution occurs in the center of the patches and the edges become thick and tough owing to accumulation of scales Acute exanthematic onset with appearance of numerous guttate lesions all over the body has been noticed in a few rare instances The course of the disease is very inconstant Individual lesions may remain localised and stationary for months with periods of improvement especially during the changes of the *Characters*

season Spontaneous recovery at one place may be followed by appearance of fresh lesions at other parts of the body, there may be complete freedom from the disease for some years after which recurrence at the old sites or in an acute form may be ushered in without any warning The general health is not affected although chronicity and recurrence is the rule, psoriasis does not induce alopecia On the fingers and toes heaped up crusts accumulate beneath the nails and give rise to deformities such as grooving, discolouration and cracking of the free edge Lesions in the axillæ, submamary folds, pubis, groin and gluteal folds often become extensively erythematous and sodden owing to perspiration and friction of clothes macerating the skin Burning and itching renders the diagnosis difficult in such cases especially on dark coloured skin Extensive generalised affection of the whole body is not very uncommon The face palms and soles may shew a few guttate lesions only in the acute exanthematic form of the disease but the condition should always be distinguished from syphilis which is far commoner than acute psoriasis The disease is seen mostly in adults, affecting males more than females Several clinical varieties have been described *psoriasis guttata* in which the lesions resemble discrete drops, *psoriasis follicularis* in which the lesions are situated at mouths of the sebaceous and sweat glands *psoriasis nummularis* in which the lesions are coin shaped, *psoriasis osteacea* in which the scales are so thick and tough that they resemble the outside of an osyter shell Other varieties such as *psoriasis gyrata, psoriasis discoidea, psoriasis rupioides*, etc, have been described

sions

The ætiology is unknown The causat ... lered b... to be a filtrable virus There is good deal of ... the rete with perivascular and perifollicular ... ssels showing marked dilatation

Treatment General Although psoriasis is generally a disease of the so called healthy subjects, attention should be paid to diet and proper elimination and adoption of general hygienic measures is also of importance A plainly cooked mixed diet, which is easily digested, is recommended, the patient should be encouraged to drink plenty of fluids and plain water to flush the kidneys Fat free diet has been recommended by many authors Constipation, when present should be treated with mild aperients and liquid paraffin, moderate exercise in the open air is helpful but vigorous exertions of any kind which induce a good deal of sweating should be avoided Attempts should also be made to relieve mental worry as much as possible A laboratory investigation for latent foci of infection should be undertaken wherever possible

Local The most effective local remedies are chrysarobin, salicylic acid and coal or wood tar The scales are first removed by alkaline baths or soft soap and each individual patch is scrubbed with a piece of soft pumice stone till the papillæ of the skin are exposed as indicated by small bleeding points in the patch treatment Ung chrysarobin (5 to 10 gr to an ounce of lanolin), is applied and allowed to act for 4 to 6 hours The center of the lesion becomes white and anæmic and an erythematous reaction appears around the patch Chrysorobin ointment is now removed with olive oil and some bland ointment (*e g*, Lassar's paste or ung borovaseline) applied on the treated patches The treatment can be repeated next day if there is no severe inflammatory reaction Sensitive subjects may shew chrysarobin dermatitis which requires calamine lotion or other cooling preparations locally In the scalp the hair is clipped short Salicylic acid 30 to 40 gr to an ounce with or without coal tar 60 gr to one ounce should be used Chrysarobin can also be conveniently used as a paint dissolved in traumaticin (chrysarobin 10 gr, gutta percha 1 dr chloroform 1 oz) and thus

save soiling of clothes and linen which stain permanently purplish black This can also be attained by using a 2 per cent alcoholic solution of chrysarobin on

chrysarobin applications over small areas but for a fairly long time Salicylic acid is best used as an ointment in strength of 20 to 120 gr in an ounce of lanolin or vaseline and can be combined with 5 to 50 per cent crude coal tar Better results are obtained when local application are used with a certain amount of friction after softening and removing the scales with soft soap or alkaline baths Coal or wood tar can be used pure but it is preferably used as a 10 to 15 per cent ointment in a lanoline base It can also be used in combination with salicylic acid Ung picis cum salicylic of the School Pharmacopoeia is a very useful preparation All strong keratolytic drug should be withheld whenever there is any sign of secondary irritation and cooling preparations like calamine lotion or plain olive oil should be applied instead For psoriasis involving the entire scalp lotions or pomades containing 10 per cent resorcin and 5 per cent salicylic acid are recommended for use at night Psoriasis of the nails is very difficult to treat owing to the hard nail matrix preventing the remedial preparations from reaching the site of the lesion The nail is softened with cautic soda solution—Fehling's solution No 2 is the best—and paints containing 1 to 5 per cent chrysarobin in collodion are used afterwards X ray exposures are of benefit but requires prolonged treatment which is not unaccompanied with the risk of X ray dermatitis Ultra violet therapy has been recommended and is of benefit in acute exanthematic types in bringing down the inflammation Its value in chronic cases is doubtful but general irradiation sometimes induces rapid involution Chronic inveterate patches can be treated with X ray but on the scalp the risk of permanent alopecia has to be borne in mind

Internal Salicin in gradually increasing doses acts beneficially in a large number of cases Commencing from an initial dose of 10 gr twice daily the quantity is increased by 10 gr every week till 30 gr is reached The maximum dose is kept up for three weeks Other intestinal antiseptics *e g* liq hydrarg perchlor zinc sulpho carbolas etc have veen used without any special advantage Preparations of arsenic have also been recommended and can be administered either in the form of Fowler s solution or Donovan s solution It is necessary to keep up the maximum dose for about six weeks and all precautions against th cumulati *Sol cin*

The use of

encouraging

a thorough local treatment in experienced hands The removal of scales and and scrubbing with pumice stone followed up with application of chrysarobin or cignolin has effected the largest number of cures at the Carmichael Hospital for Tropical Diseases

(4) Inflammatory Diseases Characterised by Multiple Bullous Lesions

(i) Epidermolysis bullosa

It is a rare hereditary condition in which blisters of varying size form on the skin as the result of trivial injuries or friction In the majority of instances the disease is noticed in early infancy the lesions appearing mostly on the back

over the bony prominences or over the napkin area. Individual lesions are generally filled with clear serum but may in rare instances contain blood. The blisters rupture within a day or two of their appearance and heal fairly rapidly provided there is no secondary infection of the raw surface with pyogenic cocci. There are practically no residual scars on healing. Repeated attacks may occur at the same site and when the fingers and toes are thus affected the growth of the nails arrested. Deeper structures are sometimes involved especially when there is secondary infection of the ruptured vesicles and thus lead to contractures and other deformities. The disease has been known to have made its first appearance during young adolescence and has been described as the acquired variety. The aetiology is unknown but is assumed to be a defective development of the cementing fibrils which fix the epidermis to the subjacent tissues. The entire epidermis is lifted up the papillary and sub-papillary vessels. The general health is in no way affected except in cases of extensive secondary infections. Subjective symptoms are conspicuous by their absence.

Treatment The treatment is very unsatisfactory and protection from injuries even of a trifling nature should be undertaken rigorously. The blisters should be punctured aseptically and dressed dry with equal parts of zinc oxide, starch and boric acid. Calcium lactate with parathyroid in suitable doses is worthy of a trial. Spontaneous recovery with attainment of puberty is not very uncommon.

Anterior pituitary extract (antuitrin S) has been tried. Viosterol and large doses of vitamin A may give temporary release. Patient should avoid trauma to the skin.

(ii) Pemphigus

An acute or chronic inflammatory disease characterised by sudden occurrence of successive crops of bullæ on an apparently normal skin and accompanied with constitutional symptoms of varying severity. The mucous membrane of the mouth and entire gastro intestinal tract as well as the conjunctivæ become ulcerated in the acute form of the disease which often terminates fatally from toxæmia and exhaustion. The aetiology is not definitely known but a bacterial infection of some kind probably plays a very important part in the causation of the disease.

Clinical varieties (1) Acute—malignant (2) Chronic—*pemphigus vulgaris*, *pemphigus foliaceus* and *pemphigus vegetans*.

Pemphigus acutus malignus This is a disease most commonly seen amongst butchers and dealers in animal carcases and generally commences from some injuries on the exposed parts of the body. The onset is accompanied with severe constitutional symptoms like fever, vomiting and prostration. Blebs of varying size appear on the l ... successive crops contiguo ... be as much as 10 cm in ... become hæmorrhagic in very acute cases. The blisters soon rupture and leave raw sanguineous weeping surfaces which tend to spread progressively at the ... Masses of detached epidermis and oozing ... osit on and give rise to a very offensive ... ion but the affected areas are very painful ... rs the patients immobile. Extensive ulcers form in the mouth, trachea and the whole of the gastro-intestinal tract, the conjunctivæ also become ulcerated, toxæmia deepens and the case terminates fatally from the effects of toxæmia, inanition and exhaustion within two or three

weeks Intercurrent diseases like pneumonia or cardio renal failure very often hasten the end In a few cases yellowish crusts form on the ruptured vesicles, the lesions cease to spread and recovery takes place only to pass into the chronic form *(pemphigus vulgaris)* of the disease

Chronic pemphigus vulgaris

Pemphigus (chronicus) vulgaris It is commonly seen in debilitated subjects beyond middle age and affects the face mouth neck or the genitals The lesions may however appear on any part of the body and become generalised in distribution As a rule crops of vesicles appear in one part of the body and after persisting for sometime disappear completely, leaving the patient almost free for more or less long periods of time The first few attacks may be mild but the constitutional symptoms and extent of the disease become more and more severe with each recurrence The mucous membrane of the mouth throat etc are ulcerated and the patient develops the toxæmic prostrated appearance of pemphigus acutus malignus prior to a fatal termination in the course of a few months The contents of the vesicles are at first serous but later becomes sero sanguineous or sero purulent Death from intercurrent pneumonia or cardiac and renal failure is more common in this type of the disease

Chronic pemphigus foliaceus

Pemphigus foliaceus A rare and grave type of chronic pemphigus in which the bullæ are flaccid and imperfectly formed with a tendency to generalised exfoliation of the skin There is no cohesion of the epidermis with the deeper layers so that the cuticle can be easily removed by friction or pinching (Nikolsky's sign) The blebs develop rapidly and involve almost the entire surface of the body, the contents which are purulent from the [illegible]
rupture of the vesicles soon after they are
large raw surfaces covered with sero pur
loosely adherent crusts form on the su
underneath and undergo decomposition giving rise to a foul sickening odour To the palpating finger the surface of the body feels as if the epidermis is floating on a bag of fluid Mucous membranes of the mouth throat and trachea become raw and ulcerated and the hair and nails may be lost Subjective symptoms are trifling or absent but constitutional symptoms of a mild degree persist throughout the course of the disease Periods of quiescence follow exacerbation but the condition of the skin never clears up completely The disease may be prolonged to several months and a fatal termination from intercurrent diseases is the rule *Pemphigus foliaceus* is believed by some dermatologists to be due to secondary infection of the vesicles of *pemphigus vulgaris* with the pyocyaneus bacillus *(Pseudomonas pyocyanea)*

Chronic pemphigus vegetans

Pemphigus vegetans It generally commences as a bullous lesion on the mucous membrane of the mouth throat and lips but as the vesicles rupture very soon after their appearance physical examination reveals only the raw moist bases Blisters soon begin to appear on the nose genitals axillæ groin and the scalp and soon rupture The raw bases instead of healing up become covered with papillomatous exuberant vegetations
sero purulent fluid of offensive odo
there are fairly long periods of inte
which marked improvement is notic
symptoms are absent in the earlier stages but later on fever and nephritis set in as complications The lesions in the mouth are very troublesome and hinder intake of nourishment The patient becomes very susceptible to pneumonia and bacillary dysentery either of which carries him away

Treatment Acute cases The patient should be put to bed on a water or air mattress preferably, and his general health should be well looked after The mouth should be gargled frequently with Condy s fluid or dilute E C. lotion and painted with boroglycerin A bath in 1 in 10 000 acriflavin or weak Condys lotion once a day is very helpful in keeping the skin clean and preventing secondary infection The food should be bland, non irritating and concentrated and given in small quantities at frequent intervals Internally tonics particularly cod liver oil arsenic iron and quinine are of value, of these arsenic has been known to exert a curative effect in a few cases It can be administered by the mouth as Fowler s solution or given intravenously as one of the arsphenamine preparations Subcutaneous injections of coagulin are worthy of trial Recently Bayer 205 has been reported to have curative effect in some cases but its action on the kidneys should be carefully watched and the urine examined every day for presence of albumin Locally, liniment of calamine is soothing Continuous application of large quantities of plain dusting powder is also helpful Extensive denuded areas should be kept moist with lint soaked in 1 in 5 000 acriflavin lotion

For *pemphigus vulgaris* a conservative line of treatment yields the best results Autogenous vaccines prepared from a culture of the contents of the vesicles have beneficial effects in checking recurrences *Pemphigus foliaceus* requires frequent antiseptic baths and local application of dusting powder along with general tonics and cod liver oil internally Autogenous pyocyaneus vaccine is of considerable value *Pemphigus vegetans* is treated on the same lines and autoserotherapy has been found successful in a few cases Arsenic in form of tryparsamide has been given in weekly injections Liver injections may control disease Vitamin D (50 000 to 400 000 units) may be tried Sulphonamides are temporarily effective when blood culture is positive in acute septic case

(iii) Dermatitis Herpetiformis

It is a chronic irritative relapsing inflammatory disease in which erythematous papular bullous or pustular lesions appear suddenly on the surface of the body and which tend to spread by peripheral extension There are very mild constitutional symptoms which very often escape notice of the patient The vesicles are very tough and do not rupture except through trauma and there is a tendency towards arrangement in groups The disease has a varying clinical character but intractable and severe itching and burning is almost invariably present An individual case may show erythematous papular bullous and pustular lesions all at the same time except in children who generally show the bullous and vesicular types of lesions The site of predilection are the posterior folds of the axillæ the buttocks abdomen the forearms and the face The lesions are very roughly symmetrical and the mucous membranes may be involved in very acute cases Axillary epitrochlear and inguinal glands become enlarged and inflamed as the result of secondary infection of the vesicles after they are ruptured No age is exempted from an attack but the disease is more common amongst adult males in poor condition of health and nervous system The disease may be prolonged to several weeks or months with periods of exacerbation alternating with those of quiescence The ætiology although not definitely known is very closely associated with chronic auto intoxication pregnancy has also been found to be a very potent factor in women Eosinophilia and indicanuria point to the disease being of allergic origin The seat of the lesions is in the corium the papillæ are œdematous the papillary and sub papillary vessels are dilated there is fair amount of perivascular infiltration and the entire epidermis is lifted up in the formation of vesicles

Treatment The first essential is to determine and eliminate all sources of toxæmia and this involves a careful investigation into the presence of septic foci in the teeth, tonsils and bowels Attention should also be paid to digestion and elimination through the bowels and kidneys mild cathartics and diuretics being exhibited whenever necessary A dermal test for sensitiveness towards food or epidermal proteins is of great value and a complete cure can sometimes be obtained by total omission of the offending article of food Internally, arsenic in the form of Fowler s solution or liquor arsenicalis hydrochloridum give encouraging results and in severe cases soamin tryparsamide or neoarsphenamine may be tried intravenously Salicylates in full doses have been recommended but their effects are rather uncertain Non specific protein therapy in the form of autogenous serum T A B vaccine or milk sometimes yields very good results Locally alkaline sulphuretted or bran baths have a soothing effect The effected areas should be wiped dry without friction on emerging from the bath and a thick layer of calamine lotion containing 0 5 per cent of carbolic acid and 5 to 20 per cent of liquor carbonis detergens applied on lint In severely irritable cases relief is often obtained by incising the vesicles and letting the contents out Areas of excoriation should be treated with weak antiseptic ointments of which a 2 per cent boracic acid or 1 per cent ammoniated mercury ointment is by far the best Bromides luminal and other hypnotics are used when the intractable itching caus s insomnia and consequent exhaustion Sulpha drugs and plasmochin have given good results Injections of liver extract fuadin calcium gluconate and colloidal manganese have been tried

Locally astringent lotion containing menthol phenol camphor liquor carbonis detergens relieve irritation When area is limited 1 per cent alcoholic solution of acriflavine may be painted

XI HAEMORRHAGIC LESIONS OF THE SKIN

1 Alopecia Areata

The disease is characterised by sudden and total loss of hair in patches and affects usually the scalp but may involve other hairy areas of the body namely the beard and moustache eyebrows pubis or the body The affected area is round or oval in outline with a few loose hairs at the periphery and the skin is smooth and glossy The hair is brol en off flush with the scalp and when pulled out presents an 'exclamation mark appearance due to atrophy of the bulb In extreme cases total baldness may supervene in a few days by steady falling of the hair in large bunches Spontaneous recovery is heralded by growth of very light coloured downy hairs which are soon replaced by stronger and stouter hair This second croup is at first very light-coloured or white but gradually changes to normal colour and texture The improvement may be arrested at any stage resulting in permanent baldness or the patches of white hair may persist Occasionally the disease continues indefinitely and is characterised by successive growths of weak short liver hair *Clinical features*

The disease is of inflammatory origin and is due to septic embolism and toxic inflammatory changes in the blood vessels of the papillary portion of the corium The most important focus of sepsis is in the teeth in the form of dental caries or apical abscesses Streptococcal infection of the tonsils is also present in a fair number of cases Endocrine and nervous imbalance are other important ætiological factors The disease usually affects grown up children and young adults of both sexes universal or total alopecia is more common in adult men

intravenously as a 12.5 per cent solution in normal saline. Blood transfusion and heteroserotherapy is sometimes curative for purpura hæmorrhagica. Vitamin D in large doses has a beneficial effect in most cases. Vitamin K is given if prothrombin is low.

XII DISEASE CAUSED BY SPASM OF THE BLOOD VESSELS

1 Thrombo-angeitis obliterans (Buerger's disease)

This is a rare condition characterised by inflammation and gradual occlusion of the arterioles by thrombosis.

The cause is still unknown, tobacco, focal sepsis and changes in the viscosity of blood are amongst the various causal factors mentioned. Of the sexes males are more affected than the females. Age of onset is difficult to determine but the average age period is about 32 years but the first onset is usually earlier. The main pathological changes occur in the arterioles which show inflammatory changes in the vessel wall. The inflammation spreads to the surrounding perivascular tissues converting the tissues into a sort of fibrous canal in which the blood vessels and the nerves are imbedded. Gradually the lumen of the arteries gets occluded, the spreading thrombosis involves the larger vessels resulting in the gangrene and ulceration of the limbs. The dis [illegible] t
more commonly than the hands [illegible] st
symptom noticed by the patient [illegible] e
pain is so severe that the patient [illegible] n
after a short rest. Gradually this walking distance becomes less and [illegible] e
patient begins to get pain even at rest. Often the patient has to sleep with the feet hanging down as this posture give him some relief by bringing more blood to the feet. Gangrene and ulceration of the affected limbs set in after some months or years.

The limbs on examination appear dead white and cold due to ischemia or cyanosis due to venous congestion. In an advanced case arterial pulsation cannot be felt.

Diagnosis. Raynaud's disease is symmetrical and affects chiefly the toes and fingers. The characteristic syndrome consisting of syncope (blanching), asphyxia (cyanosis) and hyperemia are often present. Pain is not so severe and may be absent.

Treatment. Rest in bed and postural treatment to relieve the pain and to bring more blood in the affected limbs in the early stages. This may be supplemented with the intravenous injections of sodium iodide or sodium citrate if there is any tendency towards thrombosis. In the later stage surgical measures like perivascular sympathectomy or lumber end ganglionectomy are advocated. Amputation of the limb has to be resorted when gangrene sets in.

2 Raynaud's Disease

It is characterised by symmetrical acrocyanosis, asphyxia and gangrene of the soft tissues of the fingers, toes and sometimes the ear and nose. The attacks are paroxysmal in nature and the ischæmia is caused by spasmodic constriction of the arteries supplying the affected part. During the spasmodic phase the part becomes pale, cold and numb and later on blue. Return to normal conditions takes place during the earlier stages without any impediment to the circulation [illegible] ral attacks the affected areas remain persistently cyanosed and

painful Superficial necrosis sets in and a gangrene of the dry type may follow causing spontaneous amputation of several digits

The exact cause of the disease is unknown The syndrome is produced by local sympathetic irritability causing at first intermittent and then almost continuous spasmodic constriction of the arteries

Treatment In the early stages the treatment is palliative with hot baths massage and high frequency current combined with general tonics calcium and cod liver oil Preparations of muscle extract yield good results which can be used both orally and intramuscularly When gangrene sets in the treatment is purely surgical Periarterial sympathectomy is followed by permanent cure

XIII ALLERGIC DISEASES OF THE SKIN

1. Allergy

Allergy may be defined as a state of hypersensitiveness in which the tissues respond abnormally to the stimuli which do not affect a normal person For instance the skin is normally subjected to various external stimuli heat light chemicals and mild injuries which do not provoke any response from the normal persons but when the skin becomes hypersensitive due to some reason or other, the stimulation however mild will produce sufficient response or reaction as to cause some pathological condition The same conditions may be present in the gastro intestinal and respiratory tracts A person may be taking some particular food for years without being ill but when the same person becomes hypersensitive to that food even a small quantity of that particular food may set up a violent reaction in the shape of vomiting and diarrhoea or by producing wheals in the skin which are very irritable Asthma is another instance of allergy in the respiratory tract *Definition*

A — ' ' ' nce produced may last the whole ue to a certain histaminlike sub he tissues as a result of reaction The allergic or hypersensitive tant irritation from a particular agent physical chemical bacterial and the like Any source of irritation if persisted for a long time may produce this allergic state and a septic focus in the body or a previously weakened state of health helps to accelerate the condition Once this allergic state is set up any stimulation however small will set up dermatitis or any other pathological condition The allergic dermatitis amongst industrial workers due to prolonged exposure to irritant chemicals is an example Scabies in children and ringworm infection in the adult if left untreated for a long time may produce a hypersensitive condition of the whole skin Intestinal infection abscess in the root of a tooth septic condition of the throat and natural or acquired sensitiveness to certain drugs and foods are among the aetiological factors of allergic dermatitis or urticaria *Congenit acquired*

The allergen or the toxin mentioned above acts through the peripheral sympathetic nerves and causes dilatation of the vessels and increased permeability of the vessel wall *Allergen*

Management of cases—Great care patience and tact should be used in dealing with cases of allergic dermatitis in which group of the chronic dermatitis may be included As every patient presents an individual problem a general routine treatment is nothing more than a temporary palliative A thorough investigation should be made in each case to find out a probable septic focus in the bowels *Management allergy*

teeth or the sinuses A careful survey of the environment and the patient's habits and hobbies might be of use, and a searching scrutiny of the dietary is very important In case of industrial workers the probable chemical or the physical agent should be tested against the patient's skin (Block's patch test) and if the patient is found sensitive then he should be kept away from the offending article Septic focus if detected should receive effective treatment If any particular food is found to which the patient is sensitive, that must be avoided Of the drugs calcium, antimony and arsenic have been found useful, patients showing high eosinophile count without any intestinal infection respond well to small doses of arsenic by mouth or by injections

Non specific protein shock is sometimes useful when the total leucocyte count is high or when a septic focus is suspected but cannot be detected

Local Treatment—Avoid all irritant drugs and chemicals Use of soap should as far as possible be cut down and superfatted soap should be substituted for the ordinary soap Warm bran bath is very soothing for the irritation Warm normal saline compress has been found useful when any inflammatory condition is present Equal parts of calamine lotion and olive oil have been found to be best suited for practically all conditions of irritation If there is weeping calamine lotion or one per cent 'aluminium acetate' lotion should be applied with a piece of sterile gauze or thin linen

If secondary infection predominates mild antiseptic compresses with boric lotion or 1/5,000 acriflavin lotion will be found suitable

In chronic cases, when there is no infection, weeping or inflammation crude coal tar made up into ointments of 50 per cent or even applied pure will often allay the irritation Ichthyol has also been found useful along with coal tar A weak salicylic acid ointment with the coal tar ointment may be used The environment may be used The environmental factor should be looked into carefully for instance, presence of poison ivy plants or the like in the house, irritant fumes or dusts from the neighbouring places The patient's hobbies might be a probable causative factor, such as gardening, where he may be handling some plants or flowers to which he is or has become sensitive, his hobby in photography where he might be using the chemicals he should avoid All these factors though apparently harmless might be keeping up the dermatitis for months or years

2. Urticaria

Urticaria is an allergic phenomenon and may be defined as an angio-neurotic affection of the skin, the cutaneous vessels reacting to a variety of stimuli It is characterised by sudden appearance of raised whitish oedematous wheals surrounded by a reddish halo These wheals itch intensely and subside after a variable time

Urticaria may be local or general

Local urticarias are due mostly to external irritants such as nettle stings bug bites susceptibility to the local application of a particular drug or chemical such as iodine turpentine etc, or to irritant plants for example poisoning General ... blood) groups

The common causes producing urticaria may be enumerated as fo —

(1) Physical agents
    (a) Exposures to cold temperature, cold baths intense heat, sun light or trauma

(b) Application of an irritant to a susceptible individual e g iodine sulphur turpentine etc.

(c) Contact with irritant plants like poison ivy

(2) Drugs—which usually cause urticaria are aspirin quinine salicylates sulfanilamide barbiturates and antibiotics

(3) Food — lobsters shrimps shell fish crabs tinned fish mushrooms and eggs

(4) Sera and vaccines — specially sera

(5) Emotions and shocks

(6) Toxins producing urticaria may be bacterial protozoal helminthic and the like or derived from food Septic focus in any part of the body may give rise to urticarial rashes septic tonsils or sinuses abscesses in the roots of teeth are commonly met with Chronic amoebic or bacillary dysentery causing urticaria is quite common in the tropics

Any food may be (a) toxic through decomposition (b) rendered toxic through faulty digestion (c) toxic to the individual through personal idiosyncrasy (d) the source of toxic mischief because through increased permeability of the intestinal mucosa foods may reach the circulation before their digestion is complete

(7) *Diseases* — (a) affecting chiefly the organs of metabolism and elimination e g diseases of the liver kidneys etc (b) caused by intestinal parasites

(8) *Endocrines* — State of endocrine imbalance at the menopause often produces urticarial rashes

Course and symptoms—With or without any definite dietary indiscretion and sometimes with the prodromal symptoms of vomiting and diarrhoea or constipation and fever there is a sudden itching of the skin with the appearance of oval round linear or multiform wheals of varying size The wheals are raised above the surface of the skin and are whitish or pale in colour surrounded by a reddish or pinkish halo The rash itches intensely and sometimes burns The wheals are velvety to touch and disappear without leaving any scar Sometimes the exudation of serum is so great that the wheals are capped by vesicles or bullae (urticaria bullosa) The exudation may be bloody in some cases (urticaria haemorrhagica) such eruptions when healed leave pigmented macules of a brown colour Urticarial wheals may appear at any part of the skin and affect [illegible] *Endocrine urticaria*

[illegible] app at after a few hours or the next day with the same symptoms as before Very often the attacks come regularly every day at the same time and persists for days or even months

An acute attack of urticaria usually lasts for a few days or weeks but the intensity gradually diminishes till the skin assumes its normal appearance Some cases have a single acute attack and are never troubled again Others suffer for months or years or even their whole lives after one attack

Some patients are born sensitised to certain proteins or external stimuli others become sensitised for the whole life after an attack For instance a man may be taking oysters or shellfish for many years without any ill effect For some reason not yet known he develops an urticarial attack after partaking of any one of these articles and since then he may remain sensitised to that food and gets an outburst whenever he happens to take it

Histopathology—The wheals are produced as the result of dilatation of the capillaries in the papillary and subpapillary plexuses and the resulting exudation of the serum Depending on the nature and amount of the exudation and the blood vessels affected the various types of urticaria have been named as follows —

(1) *Urticaria bullosa*—when the exudation is so great that the wheals are capped or replaced by vesicles or bullae

(2) *Urticaria haemorrhagica*—When the exudation consists of blood instead of being serum only

(3) *Giant urticaria* or *angioneurotic oedema*—In this condition the blood vessels of the deep layer are affected and there is a considerable amount of exudation The wheals are large not so definitely marginated without any reddish halo and come and disappear suddenly It is commonly met with in highly strung nervous women

(4) *Dermatographism*—Urticaria factitia

This is a state of allergy when the whole integument will respond with an urticarial reaction to any external stimulus If with a blunt pointed article figures or lines are drawn on the skin urticarial wheals corresponding to these figures or lines will appear This state of allergy or hypersensitiveness may be present from birth or may develop with an acute urticarial attack and disappear with the cure of the urticaria or persist throughout life

(5) *Urticaria papulosa*—Lichen urticatus Strophulus Gun rash This condition is usually met with in infants and young children and consists of reddish macules each with a central papule The macules fade in a few hours but the papules persist The lesions are intensely itchy and become worse at night when fresh crops appear The external surface of the limbs are chiefly affected but the buttocks and back are often involved

The exciting cause is probably due to flea bites or some defective arrangement of home sleeping coupled with an allergic state of the skin due to faulty metabolism These lesions are to be carefully differentiated from the disease they simulate that is scabies A careful dietary and removal of the patient from home often cures the condition at once

Treatment—Every case of urticaria is an individual problem and as such is to be dealt with separately A thorough clinical examination and shifting inquiry should be made to find out the probable aetiological factor and no pain should be spared for a through investigation of the case

In cases of sudden acute attack with vomiting and diarrhoea the dietetic error is often detected and the patient recovers early The persistent cases are likely to tax the physicians patience and resources The probable aetiological factors enumerated above should be eliminated one by one A careful survey of the patient s environment and thorough investigation as to his occupation habits and hobbies often prove to be useful For instance the patient s recent removal to a house where the new paints or some irritant plants may be the offending factor His occupation where he has to handle any irritant substance or his hobbies of gardening etc where unknowingly he may be coming in contact with a particular flower or plant he is sensitive to may be the cause of this persistent attack of urticaria The hypersensiveness to these external stimuli may be determined by Block s patch test The habit of taking drug like phenolphthalein quinine aspirin etc may be the source of stimulation causing the rash

The probable presence of septic foci in the tonsils teeth throat or nasal sinuses should be looked for and if detected must be treated effectively

Patient s clothes —Some dye or texture may be irritant to his skin In case of women imperfectly cured furs may be the cause of urticaria

Intestinal infection—bacterial protozoal or helminthic—is a very important factor and in the tropics chronic dysentery, amoebic or bacterial, and helminthic infection of the bowels have often been proved to be the cause of persistent urticaria *Intesti infecti*

Diseases of the liver, gall bladder, and even malaria have been said to cause urticaria Indigestion constipation, or diarrhoea may cause defective absorption of food or defective elimination, causing absorption of toxins from the alimentary canal

In case of women, menstrual or climacteric disturbances should be properly attended to

Patient s sensitiveness to particular articles of food should be ascertained This can be done in two ways (1) Dermal tests with the extracts of proteins of the various articles The protein extracts can be had ready prepared by reputed firms or can be made locally (2) By the process of elimination of one article of his diet at a time for a few days To do this a note is made of all the food the patient commonly takes including the seasonings, and omit one article from his diet for 1 week at a time while he takes the rest Milk, fish, meat, potato rice wheat onion etc are the usual articles *Food*

In the first week —patient omits milk (including all milk products such as butter cream pudding containing milk) but partakes of all the rest

In the second week—he omits all fish but takes milk and the rest

In the 3rd week—he omits all meats but takes milk, fish and all the rest

In the 4th week—he omits potato and so forth

If in any particular week the patient is found better and without any rash, then he should continue taking the same articles next week and notice if there is any recurrence If there is no recurrence the patient should take the article he omitted during the previous two weeks when he was symptom free and see if the symptoms re appear as a result of inclusion of this particular item in his diet If the symptoms re appear then it may be concluded that the patient is sensitive to that particular food or the particular group of food to which it belongs This may be confirmed by repetition of the experiment It may be [illegible] to test all the common [illegible] ensitive to a group say [illegible] d separately as before [illegible] utton beef, pork, fowl etc should be tested separately, so also in case of fish vegetables, fruits etc *Dietet*

If the offending article is detected the patient should avoid that food for a long time and must partake of a very small quantity of it if he wants to try that food again even after a prolonged period If still found sensitive he must avoid that article altogether or get himself desensitised against the offending substance, food or other material While the investigation is being carried on the following routure treatment is often useful

In case of an acute attack —Put the patient in bed, treat the constipation or diarrhoea as the case may be and allay the mental worries and anxieties if any In severe cases a hypodermic injection of ½ ccm of solution of adrenaline (1/1000) with ½ ccm of pituitrin should be given at once and repeated every 12 hours if necessary Cases sensitive or allergic to adrenaline will respond to emetine hydrochlor injection ½ gr once daily

Locally Cooling soothing lotions like calamine lotion or Goulard s lotion should be applied freely In some cases warm sodium bicarbonate lotion or 0.25 per cent phenol lotion will give more relief than cooling lotions *Local*

This condition is best treated with pentavalent antimony compounds of which neostibosan (von Heyden 693) gives the best results The dosage is 0 1 gm gradually increasing to 0 5 gm, intravenously, one injection is given every day

secondary thickening of the skin is treated with geratolytic ointments and paints containing resorcin and acetic acid in a suitable proportion which is not too strong and irritating to the skin of the patient

Penicillin sulphonamides, cod liver oil, high vitamin diet specially vitamin A and liver *injections are useful Fractional doses of unfiltered* X *ray* are effective and are particularly useful in exfoliative dermatitis due to arsenicals A 5% salicylic acid ointment in cotton seed oil for local application is soothing

4. Eczema

It is a symptom complex of any chronic dermatitis and not a disease *sui generis*, as the symptoms and pathological changes are found in most of the chronic inflammatory diseases of the skin *It is characterised by four cardinal symptoms,* namely, pain and irritation, redness, heat and swelling of the part affected Clinically, two types are met with, the dry and weeping eczemas The lesions begin as localised papular or vesicopustular eruption with a good deal of inflammation and infiltration of the true skin These vesicles often burst and keep oozing serum—*hence the name weeping eczema' After persisting for some time,* which may be prolonged to several months, there is a certain amount of abatement of symptoms but the affected area remains thickened and harsh Recurrence is very common and secondary changes in the skin begin to appear with each fresh attack These changes may involve the texture of the epidermis and the dermis *as well as the pigmentation of the skin Complications arising from secondary* infection of the vesicles with pyogenic cocci are very common and completely alter the clinical picture in majority of cases The ætiology is obscure in most cases The lesions are caused by dilatation of the papillary and interpapillary capillary twigs with œdema of the papillæ and the rete accompanied by perivascular *inflammatory exudate*

It has been observed that the two main factors concerned in the production of a protean lesion like eczema are (*i*) external parasitic infection, and (*ii*) the susceptibility of the skin affected In this country ringworm and seborrhœa are the two commonest primary infections of the glabrous skin and also scabies *especially in children Secondary infection with streptococci and staphylococci* are concerned in the production of induration of the skin oozing of serum and formation of pustules T ... in depends on the fineness of textur... *activity of* the endocrine glands whi... It is for *this reason that some ecz*... hand this susceptibility may be due ... il infection especially in the bowels ... l of animal food Chemical and other irritants acting on one particular area of the skin for a long time produce local kataphylaxia and thus enhance the acquired susceptibility

Briefly eczematous dermatitis is characterised by (1) three progressive stages—erythema, exudation and infiltrations (2) The presence of itching or burning The vesicular stage occours in all *stages of the disease* The term eczema is a complex symptom only which denotes local or generalised patches

of dermatitis of unknown origin It is only a descriptive term for clinical reaction Many conditions which were formerly classified as eczema have now their ætiology worked out and are separate entities e g, contact dermatitis seborrhoeic dermatitis deratomycosis etc

Treatment The treatment has to be undertaken in three stages First of all the secondary infection is to be treated with local applications according to the nature of the infecting organism Staphylococcal infection requires antiseptic baths and compresses with 5 per cent boric lotion lysol lotion 1 in 20 or chinosol solution 1 in 100 after which 5 per cent gentian violet solution in 20 per cent alcohol should be applied night and morning Streptococcal infections should be treated with continuous applications of cooling evaporating lotions of which calamine lotion is the best Cold compresses with 1 in 3000 acriflavin lotion is also of benefit When the secondary infection is cured the primary infection can be treated with Whitefield s ointment ringworm paint or sulphur lotion according to whether it is ringworm or seborrhoea The peripheral blood should be examined for evidence of eosinophilia and the stools examined serially to detect chronic *Treatment*

•

Eczema responds best to sulphonamides and penicillin therapy In adults sulphadiazine 1 0 gm orally every six hours day and night continued for 48 hours and then half dose for three days Procaine penicillin 300 000 to 600 000 units daily intramuscularly to maintain effective blood levels X ray may be helpful Locally cold compresses of saturated boric lotion Codeine and barbiturates may be tried to relieve symptoms *Penicillin*

5 Dermatitis Repens or Acrodermatitis Perstans

This is a subacute or chronic inflammatory disease of the skin and is characterised by patches of raw glazed looking denuded rete surrounded by a slightly elevated ragged or irregular undermined edges formed by the broken horny epithelium A fair amount of serum or pus can be squeezed from the undermined edges The disease usually begins at the site of some minor trivial injuries as a red erythematous patch with formation of vesicles within a day or two after the initial abrasion These vesicles soon rupture and give rise to the characteristic lesions which tend to spread peripherally The disease is more commonly seen on the fingers but occasionally on the toes and soles of the feet A few cases occur without any primary injury It is slowly progressive in character but healing generally takes place at the centre of the lesion more rapidly than the spread at the margins Constitutional symptoms are absent and local pain and itching is almost negligible The ætiology is rather obscure but in majority of cases it is due to a condition of kataphylaxis or loss of the defensive power of the tissues against pyogenic organisms Some chronic cases go on for months or years in spite of treatment *Characters*

Treatment All the ragged epithelium at the undermined edge should be clipped off If there is excessive oozing of serum the most effective treatment is dusting with tannic acid Local antiseptic baths with 1 in 5000 acriflavine lotion or dressing with hypertonic saline control the spread effectively Bland ointments like borovaseline or plain zinc ointment should be applied at night Internally tonics with iron, arsenic and quinine in combination or calcium lactate with *Treatment*

parathyroid act well Vaccine therapy is recommended and is usually followed by marked improvement Prophylaxis in the way of protection from injuries is very important

XIV. NEUROSES OF THE SKIN

1. Pruritus (Itching)

It is more a symptom than a distinct clinical entity and accompanies various skin diseases of both external and internal origin It may be defined as intract able irritation of the skin usually of a spasmodic nature without any evidence ires of dermatitis or other inflammatory lesions on the surface As a rule localised areas on the trunk or limbs are affected but involvement of the whole body is

to determine the underlying cause of which the following are important — (1) Systemic diseases like diabets carcinoma leukæmia arteriosclerosis Bright s disease Grave s disease certain disorders of the nervous system Mycosis fungoides (2) Intoxications e g high blood icterus faulty elimination and stasis in the bowles fermentation and chronic dysentery (3) Endocrine imbalance at the climacteric period in woman (4) Certain deficiencies especially of vitamin B complex (5) Ingestion of certain foods, especially shell fish and tinned products (6) Ingestion of certain drugs which are eliminated through the skin e g copaiba arsenic etc The commonest external causes are —

(1) Mechanical such as harsh or woollen clothes corsetry and tight lacing stretching of the skin as in pregnancy, etc (2) Chemical e g too frequent use of soap aniline dyes used for colouring socks stockings and underlinen chemical insecticides etc (3) Parasitic e g scabies ringworm and seborrhoeic dermatitis.

Treatment General Removal of the cause is the first essential and in attaining this every case has to be treated on its own merit Co operation of the patient is a very important factor and highly strung or neurotic subjects are sometimes extremely difficult to treat because the habit of scratching is kept up subconsciously Administration of calomel in a 2 to 4 gr dose at bed time followed by a saline cathartic the next morning is a good routine measure to adopt A complete change of diet is also of value Exhibition of sedatives may be required for relieving the irritation especially when the patient is tired and exhausted for want of sleep at night Bromides in full doses and barbituric acid Harsh woollen the room should

Local A soothing bath containing bran bicarbonate of soda or menthol is given twice daily The temperature is kept at about 78° to 80° F and cold water is gradually added till the temperature drops to about 55° to 60°F A cold spray before emerging from the bath is advised The skin should be dried by gently patting with a soft towel and dusting powder or antipruritic lotions applied liberally Of the various anti puritic remedies phenol in a 2 to 5 per cent lotion and menthol in 0 5 per cent alcoholic solution give best results Liq carbonis detergens in 2 to 8 per cent alcoholic solution is also of value Generalised ultra violet radiation sometimes brings immediate relief Repeated exposures are necessary in the treatment of chronic cases and the abatement of symptoms is always gradual

Localised pruritus of the anus, vulva, scrotum Etc A localised form of pruritus of the anus vulva or scrotum requires special attention The exact ætiology is still unknown, but any of the factors enumerated above might set up the very intense and intolerable irritation and once the pruritus starts it is hard to cure the condition

As a result of intense irritation and scratching secondary changes occur very soon In the scrotum the skin becomes thickened and the natural furrows become deepend and the scrotum appears to be bigger in size Marks of excoriation and even ulceration are often present and eczematous condition due to secondary infection supervenes

In pruritus, anus fissures and ulcerations in the perianal region are always found due to scratching The muco cutaneous junction becomes thickened and lichenified at first and afterwards there is atrophy of the skin

Pruritus Vulvæ As the result of scratching due to intolerable irritation the tissues of the vulvæ including labia minora and clitoris become excoriated and thickened Secondary infection makes the condition eczematous and presents a wash leather appearance After a time the mucous surfaces become dry patches of leucoplakia occur and the skin gets atrophied This distressing condition has been named Kraurosis Vulvæ and occurs after menopause but may develop earlier *Senile pruritus* is due to arteriosclerosis and sexual neurosis *Pruritus hiemalis* or winter itch occurs in winter months due to dryness of the skin The trunk and extensar and inner surfaces of the thigh are specially involved *Bath pruritus* is due to excessive use of soap *Toxic pruritus* is associated with fever jaundice nephritis auto intoxication, etc *Allergic pruritus* is due to certain foods odours and vapours *Pruritu* *Bath P*

Treatment Very careful and exhaustive search must be made to find out the ætiological factor and when detected that must be effectively dealth with Ringworm infection of the scrotum anus or vulva is not an uncommon cause and must be carefully sought for Thread worms piles fistula or anal fissures might give rise to the pruritus in the anus Discharges from the vagina should be looked for Menstrual disturbance in women is often an important factor and this condition should receive careful attention General hygienic measures together with wellbalanced food light and nutritous are important Stimulating drinks such as alcohol and highly spiced food must be avoided Change of climate proves sometimes beneficial Powels should be kept open and intestinal infection if any, should be sought for and corrected A warm saline enema every night before retiring to bed is sometimes helpful A pessari with zinc oxide 3 or 4 grains inserted after the enema or a wash might prove beneficial Antipruritic local applications are at the best temporary palliatives only and do not help in the cure Infiltration with local anæsthetics such as cocaine and its various derivatives might be of some use in mild cases In more severe cases resection of the local nerve endings might be of some use and failing that radium therapy may have to be given In kraurosis vulvæ gonadal hormones together with the administration of vitamin A and B Complex have proved of some value Antipruritus ointments containing three per cent benzocaine or nupercaine give temporary relief Hot baths or iced wet packs may be applied Phonol 1 0 gm menthol 0 25 gm zinc oxide ointment q s 100 grams or lubricating jelly gives relief In chronic cases X ray is useful Perineal injection of 70 per cent alcohol are successful and give relief for several months two to four minims of this solution are injected to each square centimeter till the whole area is covered Sensary nerves to the areamay be divided In prutitus vulvæ with senile changes 2000 to 10000 units of estrome (Theelin) may be injected twice a week for 4-8 weeks *Treatm* *Hygien*

2. Prurigo

It is a chronic inflammatory disease characterised by the appearance of successive crops of small flesh coloured extremely itchy papules with a predilection for the extensor aspect of the limbs and the lower abdomen These papules become excoriated owing to the scratching and the skin between the papules is *often xerotic or eczematoid* A large percentage of these cases shew dermographism Lesions may occasionally appear on the trunk face forehead and the scalp but the skin of the groins and axillæ are always free The ætiology of the disease *is not known but it is very closely* related to the allergic group of inflammatory diseases with which it is often associated

Clinically three varieties have been described (*a*) *Prurigo mitis* is a comparatively *mild affection* and the constitutional disturbances are not very marked (*b*) *Prurigo ferox* is the severe form of the disease characterised by incessant scratching constitutional disturbances and mental impairment The disease is usually localised *in certain areas although the whole body is sometimes* affected *Prurigo ferox* is a comparatively rare disease (*c*) *Prurigo nodularis* is an extremely rare form of chronic inflammatory disease characterised by formation of nodular eruptions chiefly on the lower legs *and constant intractable irritation* which prevents the patient from taking rest by day or night The onset is insiduous and is sometimes associated with urticaria Women are affected more often than men The ætiology is not known and unlike *prurigo mitis* and *prurigo ferox* the disease appears later in life

Treatment General A thorough investigation into the presence of septic foci and other sources of auto intoxication is essential The diet should be changed radically and good nourishing food plainly but agreeably cooked is indicated Tonics with combination of iron arsenic quinine and strychnine are necessary in cases with *a low condition of health Thyroid extract in half grain* doses twice daily can also be given for its tonic effect General ultra violet light baths are beneficial

Local Antipruritic lotions and ointments containing 1 to 2 per cent of phenol and 2 to 3 per cent of liquor carbonis detergens relieve the irritation to a great extent Beta naphthol 2 per cent with coal tar 10 per cent in lanolin base is useful when secondary hyperkeratosis is present *Prurigo forox responds* quickly to X ray therapy and radical cure may be established within two to four weeks especially in children In the case of aduts a good many recur after complete freedom *from symptoms for some months*

Prurigo nodularis calls for strong chrysarobin (2 to 5 per cent in a *lotion*) and X ray therapy for relief of symptoms Freezing with carbon dioxide snow or complete excision *of the nodules give satisfactory results although a few* nodules may recur and require treatment for the second time Phenol and liquor potassæ 15 per cent of each dissolved in olive oil sometimes give immediate *but temporary relief*

XV GRANULOMAS

These are solid areas of cellular infiltration of the pars reticularis of the corium induced by specific micro organisms or their toxins and consist chiefly of endothelial cells Granulomas are classified as follows —

I Those that pass through three distinct stages *before the granulomatous* lesions are fully developed namely —(*a*) Initial lesion followed by lymphatic
15 permeation (*b*) Invasion of the blood stream septicæmia and production of

cutaneous rashes (c) Granulomatous stage with or without ulceration Examples are syphilis, yaws and leprosy

II Those that shew two stages in their evolution, namely, (a) Initial lesion followed by lymphatic permeation and spread to the nearest lymph node (b) Formation of granulomas along the lymphatics when further spread is obstructed by sclerosis and fibrosis Examples are tuberculosis, blastomycosis and sporotrichosis All these lesions break down and ulcerate

III Those with only one stage, namely the initial lesion at the site of implantation with both centripetal and centrifugal spread Examples are actinomycosis, oriental sore rhinoscleroma and infective granuloma

In dermal leishmaniasis there is no initial lesion but the parasites are lodged in the peripheral vessels and give rise to leucodermic spots at first the granulomatous nodules developing afterwards The lesions hardly ever ulcerate

Botriomycosis or granuloma pyogenicum is not a true granuloma but a condition of excessive growth of granulation tissue owing to the irritation of an infective organism usually the staphylococcus

Treatment The treatment of different types of granulomas has been dealt with in various chapters

XVI. SKIN DISEASES DUE TO DEFICIENCY

Skin diseases due to deficiency are mostly part of the symptoms of a general disease which are manifested on the skin But sometimes the skin symptoms are the first to attract the attention of the patient or their physicians before more grave internal troubles are recognised

The deficiency is mostly of the vitamin complex and rarely there is a clear cut case where a single vitamin deficiency explains all the conditions and whose administration effects a cure The deficiency may be either in the intake of the food which is poor of a particular vitamin or the deficiency may due to a defective absorption from the alimentary canal owing to some gastro intestinal derangement Both the conditions may be present in the same individual

1. Skin Lesions due to Vitamin A Deficiency. Lichen spinulosus—Keratosis follicularis—Phrynoderma.

Deficiency of Vitamin A generally produces dryness of the skin and hyperkeratosis of the hair follicles These are often accompanied by changes in the eyes and softening of the nails According to the different stages of development met with the same condition or the symptom complex has hitherto fore been described under different names such as Lichen spinulosus, Keratosis follicularis and Phrynoderma Recently Pityriasis rubra pilaris and Darier s disease are said to have been treated successfully by the administration of larger doses of vitamin A

Lichen spinulosus—This early manifestation of the disease on the skin is chiefly met with in the children and young adults and is characterised by minute discrete filiform spines protruding from thickened hair follicles The individual lesion is a small pin head sized papule around a hair follicle which is surmounted by a filiform spine projecting about 1/8 of an inch from the surface. The top end of the spine is quite sharp and gives nutmeg grater sensation when the patch is felt by the hand The lesions remain discrete and occur in groups or patches and come out in successive crops The patches may occur on different parts

of the trunk and limbs but are common on the back, shoulders back of the elbows and the front of the knees Usually the general health of the patient is not affected at this stage except in a few instances where eye changes in the shape of *Xerophthalmia or Keratomalacia may be present*

Keratosis follicularis—As the patient passes from the childhood to the adolescence the skin lesions become more and more marked The filiform spines loose their sharpness and develop into hard thickened papules formed by piling *up of the epithelial scales round the hair fo*
more and more pigmented and the lesions
Certain amount of dryness of the skin and
present but this is not common, the eye changes are sometimes seen such as night blindness or keratomalacia

Phrynoderma—The third stage named by Nichols as Phrynoderma (toad skin) is met with commonly in adults but children are also affected This condition is characterised by general dryness and roughness of the skin (Xeroderma) The filiform spinous papules round the hair follicles become more *prominent and dark and extend further to the other parts of the body* The papules loose their sharpness, become thick pigmented and the general surface of the skin becomes rough and gives a nutmeg grater sensation to the hands. Angular cheilitis of the mouth and ulceration of the tongue is found in the majority of the cases Xerophthalmia keratomalacia or night blindness are quite *common and may be the first sign of illness for which the patient seeks medical* advice when the skin symptoms are noticed The hair assume a peculiar dirty brown colour and loose their lustre In well advanced cases the patients are debilitated and there might be peripheral neuritis of the feet Gastro intestinal symptoms such as diarrhoea and dysentery are present at this stage and if not properly treated may *be the terminal symptoms A still further stage has been* seen when the hyperkeratosis of the palms of the hands and soles of the feet *becomes very much marked like that of sclerodenna* The finger ends become tapering and on the pressure points the hyperkeratotic condition may develop into painful corns and calosities so much so that the patients become crippled

[illegible]
pneumonia

Treatm [illegible] carefully chosen well balanced diet easily [illegible] importance Many cases are cured with [illegible] medicine

In the early stage of *Lichen spinulosus the general health is generally fair* and the subjects do not look ill The only other signs may be Xerophthalmia For the local skin condition salicylic acid ointment dr ½ to 1 oz should be applied twice daily Internally cod liver oil supplemented with concentrated vitamin A in doses of 10 000 units per day generally effects cure In the later stages of kerotosis follicularis and when there is a general run down condition the patient should be put to rest in bed A thorough investigation should be made as to the probable factor of tocal sepsis in the bowels teeth nasal sinuses [illegible] and when these are detected they should be treated effectively

in adequate doses A single vitamin is often not sufficient It is good practice to start with the administration of concentrated vitamin preparations parenterally supplemented by oral administration the later to be continued for a prolonged period Intramuscular injection of 1 c.cm of Prepaline (Glaxo) and 2 c.c m of liver extract crude on alternate days for two to four weeks yields satisfactory results Orally cod liver oil ½ oz daily with ½ c.cm of prepaline and four to six dried yeast tablets should be continued for a long time even after all the symptoms have disappeared Vitamin A is given in large doses to start with such as 100 000 or 200 000 units daily which then is gradually reduced and a maintenance dose as mentioned above is to be continued for a long time Thyroid extract in doses of 1 3 gr daily is an useful adjunct Thyroid should be given when the patient is in bed

2 Pityriasis rubra pilaris

This is a chronic scaly condition of the skin characterised by patches of flocular hyperkeratosis and erythema on the sites of predilection namely extensor surface of the trunk fingers arms elbows and knees

The condition is generally found in adults and young adolescents Both the sexes are effected but the males are more frequently then the females The exact cause is still unknown and the disease had hitherto been classed as due to endocrine imbalance Recently some cases are said to have been cured with large doses of vitamin A There seems to be a familial tendency, children of the same parents are affected and this may be due to the same kind of food the patients get to eat

The disease generally starts with scaliness and erythema of the scalp and gradually spreads on the neck face trunk and on the extremities The palms of the hands and soles of the feet become red and papular lesions crop up round the hair follicles of the limbs Individual lesion consists of a dry hard papule which is really a horny plug on the mouth of sebaceous of sweat glands The papules which are discrete at first aggregate as they evolve and form patches which look like exaggerated goose skin and give the sensation of nutmeg grater On the extensor surface like the front of the knees and the back of the elbows these aggregated papules form patches or plaques and look patches of psoriasis The individual papules can still be discerned on the dorsal surface of the fingers and in the arms and thighs On the palms of the hands and soles of the feet there is thickening like that of Scleroderma and painful cracks and fissures occur due to the loss of elasticity There is a generalised thickening of the skin with diffuse erythema and a certain amount of scaling *Clinical symptoms.*

Treatment —Rest in bed and general hygienic measures are very important factors Investigation of the probable cause of defective absorption of food is necessary A well balanced diet together with big doses of vitamin A as much as 100 000 units per day is advised Along with this small doses of thyroid helps the treatment

Administration of Vitamin A is said to have cured or benifitted the following conditions Porokeratosis and darier s disease are said to have been cured [illegible]

3. Vitamin B Deficiencies.

Deficiency of the vitamin B which is a very complex vitamin and has many factors such as B_1, B_2 and others produces *protein* symptoms The skin symptoms

produced by the deficiency of this vitamin concern mostly with B_1 factor of this complex B_1 has been reported as a valuable adjunct in the therapy of psoriasis and is said to be of use in the treatment of pink disease (acrodynia) in children Symptoms of Riboflavine (Vitamin B_2) deficiency are characterised by redness of the buccal surface of the lips, desquamation and ulceration of the angles of the mouth (angular cheilitis) The surface of the tongue becomes red and granular owing to the desquamation and ulceration The nasolabial folds eyelids and alae nasi become rough and scaling like seborrhœa Eye symptoms such as visual fatigue and photophobia may be present

Deficiency in the nicotinic acid causes the well known symptoms of pellagra

Pellagra—Pellagra is characterised by dermatitis, diarrhœa and dementia This affects chiefly the poorer classes who are forced to take an unbalanced diet where the B_3 factor of the vitamin B complex may be absent or deficient Very soon, disturbances in the alimentary system may lead to deficiency of the associated vitamins the most important being B_1 and A

The disease has definite seasonal incidence, though the season is different in different countries, it is constant in any particular country Sunlight and ultra violet rays make the skin condition worse

The onset may be either with dermatitis or diarrhoea and associated with it pain and difficulty in swallowing hot or spiced food due to denudation of the epithelial layers of the tongue The dermatitis is symmetrical and affects the exposed surfaces—namely the dorsum of the hands and extensor surfaces of the forearms, the dorsum of the feet, ankles and front of the legs, the back of the elbows, the neck and the knees On the face the malar eminences are affected In advanced cases axillary folds and genitalia may be affected The skin over these patches is at first erythematous and slightly scaling suggesting sun burn Then the pigmentation deepens and the skin becomes thickened scaly and assumes the peculiar lemon yellow or sepia colour and is covered with thick crusts In advanced cases these may ulcerate [illegible]
symptoms of dyspepsia or diarrhœa [illegible]
of its epithelium and may be even [illegible]
is a constant factor, peripheral neu[illegible]
body, and tremors of the tongue and hands may be present debility is well marked and anaemia may be present Later mental changes are marked which is a characteristic sign of the disease There is headache, insomnia and melancholia which may lead to suicide

[illegible]

followed by salicylic acid ointment application is sufficient Sodium thiosulphate 0 5 gm in 5 c cm intravenously daily up to 10 or 15 injections will clear up the dermatitis For the general condition nicotinic acid by mouth 500 mgm daily for the first week followed by 100 mgm daily till all symptoms disappear For neuritis Vitamin B may be given by mouth or by parenteral method Even after complete cure the patients should be kept under hygienic conditions with good food and given nicotinic acid for a long time as relapses are very common

Besides the classical conditions described above, the following conditions are said to have been cured or benefitted by the administration of vitamin B

A Vitamin B Complex —(1) Chronic eczema (2) Glossitis with stomatitis (3) Neurodermatitis of the back and sides of the neck (4) Lupus erythematosus (5) Kraurosis Vulvae

B Vitamin B_1 —Post herpetic neuritis
C Nicotinic acid —(1) In disagreeable subjective effects in sulfonamide therapy (2) Vincents' angina.

XVII. ALOPECIA AREATA.

The disease is characterised by sudden and total loss of hair in patches and affects usually the scalp but may involve other hairy areas of the body namely the beard and moustache, eyebrows, pubis or the body The effected area is round or oval in outline with a few loose hairs at the periphery and the skin is smooth and glossy The hair is broken off flush with the scalp and when pulled out presents an 'exclamation mark' appearance due to atrophy of the bulb In extreme cases total baldness may supervene in a few days by steady falling of the hair in large bunches Spontaneous recovery is heralded by growth of very light-coloured downy hair which are soon replaced by stronger and stouter hair This second crop is at first very light coloured or white but gradually changes to normal colour and texture The improvement may be arrested at any stage resulting in permanent baldness or the patches of white hair may persist Occasionally the disease continues indefinitely and is characterised by successive growths of weak short lived hair *Characters*

The disease is of inflammatory origin and is due to septic embolism and toxic inflammatory changes in the blood vessels of the papillary portion of the corium The most important focus of sepsis is in the teeth in the form of dental caries or apical abscesses Streptococcal infection of the tonsils is also present in a fair number of cases Endocrine and nervous imbalance are other important ætiological factors The disease usually affects grown up children and young adults of both sexes universal or total alopecia is more common in adult men

Treatment Every case requires investigation into the presence of sepsis in the teeth and tonsils which should be treated by extraction, operative measures and autovaccine therapy according to the merits of the case. All sources of mental worry and anxiety should be removed Vascular tonics like calcium lactate 10 gr with parathyroid 1/10 gr general tonics and cod liver oil are very useful. Hexamine in 10 gr doses given over a fairly long period usually cuts short the duration of the disease. *Endocrine* products are required for cases with evident defect or imbalance of the ductless glands When mental or nervous factors are present sedatives and hypnotics are indicated

Local Stimulating applications are indicated of which 95 per cent phenol gives most satisfactory results It should be applied as a thin film and allowed to remain for about an hour For treating patches on the eye brows or the face it should be diluted with equal amount of glycerine An ointment containing pilocarpine nitrate 1 gr betanaphthol 1 dr lanolin 2 dr to an ounce of vaseline is recommended, this should be applied with friction over the patches twice daily *Local Treatment*

Intracutaneous injections locally of milk or acetylcholine in doses from 0 2 to 0 5 ccm often stimulate the growth of hair Ultraviolet irradiation locally in suberythema doses is beneficial and should be carried out for some time

produced by the deficiency of this vitamin concern mostly with B_2 factor of this complex B_1 has been reported as a valuable adjunct in the therapy of psoriasis and is said to be of use in the treatment of pink disease (acrodynia) in children.

B²

Symptoms of Riboflavine (Vitamin B_2) deficiency are characterised by redness of the buccal surface of the lips desquamation and ulceration of the angles of the mouth (angular cheilitis) The surface of the tongue becomes red and granular owing to the desquamation and ulceration The nasolabial folds eyelids and alae nasi become rough and scaling like seborrhoea Eye symptoms such as visual fatigue and photophobia may be present.

Deficiency in the nicotinic acid causes the well known symptoms of pellagra

acid
y

Pellagra—Pellagra is characterised by dermatitis diarrhoea and dementia.
This affects chiefly the poorer classes who are forced to take an unbalanced diet where the B_2 factor of the vitamin B complex may be absent or deficient. Very soon disturbances in the alimentary system may lead to deficiency of the associated vitamins the most important being B_1 and A

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Treatment Patients should be removed to good hygienic surroundings put to bed and given easily digestible mixed diet with plenty of milk, fresh vegetables fruit and eggs The food should be supplemented with Vitamin B complex such as yeast For the skin condition locally liniment calamine in acute stage followed by salicylic acid ointment application is sufficient. Sodium thiosulphate 0 5 gm in 5 c cm intravenously daily up to 10 or 15 injections will clear up the dermatitis For the general condition nicotinic acid by mouth 500 mgm. daily for the first week followed by 100 mgm daily till all symptoms disappear For neuritis Vitamin B may be given by mouth or by parenteral method. Even after complete cure the patients should be kept under hygienic conditions with good food and given nicotinic acid for a long time as relapses are very common.

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XVII ALOPECIA AREATA.

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Deficiency in the nicotinic acid causes the well known symptoms of pellagra.

Pellagra—Pellagra is characterised by dermatitis, diarrhoea and dementia

This affects chiefly the poorer classes who are forced to take an unbalanced diet where the B_3 factor of the vitamin B complex may be absent or deficient. Very soon, disturbances in the alimentary system may lead to deficiency of the associated vitamins the most important being B_1 and A

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Treatment Every case requires investigation into the presence of sepsis in the teeth and tonsils which should be treated by extraction operative measures and autovaccine therapy according to the merits of the case All sources of mental worry and anxiety should be removed Vascular tonics like calcium lactate 10 gr with parathyroid 1/10 gr general tonics and cod liver oil are very useful Hexamine in 10 gr doses given over a fairly long period usually cuts short the duration of the disease *Endocrine* products are required for cases with evident defect or imbalance of the ductless glands When mental or nervous factors are present sedatives and hypnotics are indicated

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PART IX

APPENDIX

DICTIONARY OF DISEASES AND TREATMENT

ACNE VULGARIS—*ACTINOMYCOSIS*—*AGRANULOCYTOSIS*—*ALLERGY*—*ANGINA* PECTORIS—ARTHRITIS—ASCITES—ASTHMA—BLOOD IN HEALTH AND DISEASE—BLOOD PRESSURE—DISORDERS OF THE BLOOD—BLOOD TRANSFUSIONS—BOILS—BRONCHITIS—BUBO (CLIMATIC BUBO)—BURNS—CARBUNCLE—CEREBROSPINAL FEVER—CEREBROSPINAL FLUID —CHOLERA — CIRCULATORY FAILURE — CLIMATIC BUBO LYMPHOGRANULOMA INGUINALE AND ALLIED CONDITIONS—COMA—COMMN COLD—CONJUNCTIVITIS — CONSTIPATION — COUGH — CRAMPS—DENGUE—DIABETES—DIARRHOEA—DIET AND DIETETICS—DIPHTHERIA—FUNCTIONAL TESTS—GASTRIC AND DUODENAL ULCERS—HAEMORRHAGE—HAEMORRHOIDS AND PILES—*HEADACHE*—*HEATSTROKE*—*HELMINTHIASIS*—*HEPATIC ABSCESS*—*HEPATOMEGALY*—HERPES—HICCOUGH—HILL DIARRHOEA—HOARSENESS—INFECTIOUS DISEASES—INFLUNZA—INSOMNIA—INTRAVENOUS THERAPY—JUNDICE—LATENT JUNDICE—KALA AZAR—LUMBAGO—MALIGNANT DISEASES—MALTA FEVER (UNDULANT FEVER)—MEASLES—MIGRAINE—MOLLUSCUM CONTAGIOSUM—MUMPS — MYIASIS—NAUSEA—NEURALGIA — NON SPECIFIC PROTEIN THEARPY—OBESITY—OEDEMA—ORGANOTHERAPY—ORIENTAL SORE—OSTEOMALACIA — OXALAEMIA—PELLAGRA—PLEURISY—PNEUMONIA — POISONING—PREGNANCY TESTS—PRURITUS—PYORRHOEA ALVEOLARIS—QUINSY—RABIES — RADIOTHERAPY—REFRIGERATION—RESPIRATION—RHEUMATISM (ACUTE)—SANDFLY FEVER—SCHISTOSOMIASIS—SCIATICA—SEA SICKNESS—SEROUS FLUIDS—SNAKE BITE—SORE THROAT—SPRUE—SPUTUM—STOOLS—SUDDEN DEATHS—SYSTEMIC DISEASES ORAL MANIFESTATIONS OF—TETANUS—TUBERCULOSIS—TYPHOID FEVER—URINE—VERTIGO — VISCEROPTOSIS — VITAMINS—VOMITING AND NAUSEA—WARTS—WHOOPING COUGH—YAWS—YELLOW FEVER

1. Agranulocytosis

Agranulocytosis or neutropænia is a *recently* recognised disease (Schultz 1922) characterised by a septic inflammation of the throat with toxæmia and marked leucopœnia affecting especially the polymorphonuclear cells

Neutropœnia occurs under the follwing conditions —

1 Infective diseases such as kala azar typhoid typhus measles influenza mumps malaria dengue

2 Diseases due to physical and chemical agents such as radium particularly S lpha drugs benzene arsenobenzol preparations h as veramon novalgin gordon cibalgin amidophen cichopyrine
openia lymphatic and myeloid leukæmia—the so called aleukæmic leukæmias

4 Severe sepsis

5 Idiopathic neutropenia

Two types of agranulocytosis are generally recognised one is a primary type the *ætiology of which is obscure and another a secondary type which is a direct* result of some recognised septic condition The condition simulates aplastic anæmia aleukæmic leukæmia Vincent s anagina influenza atypical Hodgkin s disease or diptheria Agranulocytosis may also occur as an event in a long illness Recent work has established that a large number of cases of agranulocytic angina are due to the toxic action of certain drugs such as Sulpha drugs arsphenamines dinitrophenols and pyramidon

The disease is seen more in middle aged females It generally starts with general malaise, lassitude headache and soreness of the throat and the mouth The condition rapidly progresses to an ulcerative or necrotic stomatitis involving

the lips, gums, tongue, tonsils, fauces, pharynx and tongue. Sometimes the skin and the intestines are likewise affected and there is pyrexia and general prostration The enlarged cervical glands are secondary manifestations to the oral condition. The blood picture is characteristic The total white-cell count is reduced to very low figures even as low as 100 to 200 per c mm and there is an absolute and relative reduction in the number of granulocytes—the neutrophilic, eosinophilic and basophilic polymorphonuclear cells The red cells; hæmoglobin and platelets are little affected A few cases show moderate or severe anæmia of the microcytic type and very rarely of the macrocytic type A chronic type of agranulocytosis has been shown to occur without the oral symptoms, the granular cells remaining for a long time between 10 to 30 per cent with total counts of 4,000 to 6 000 per c.mm The condition is considered to be due to the non formation of the granular leucocytes rather than their excessive destruction The primary cause is thought to be depression of the bone marrow functions The evidence of regneration of the myelopoietic tissues as shown by the myelocytic response favours the view that agranulocytosis is primarily a marrow dyscrasia The organisms cultured from the throat lesion and blood are not specific causal agents, but are regarded as terminal invaders *Chronic type*

Treatment A thorough inquiry should be made regarding the use of toxic drugs responsible for the production of agranulocytosis, such as benzene, arsenical and gold preparations, dinitro phenols and the benzamine group of drugs The use of these drugs should be strictly forbidden Penicillin may be tried in fulminating cases The different forms of treatment which appear to have beneficial effects are (1) Repeated transfusions of 250 to 500 c cm of citrated blood every other day or at longer intervals (2) Irradiation of the skeleton with small doses of X rays This treatment is based on the law that small dases stimulate, while large doses destroy, radio-sensitive cells Hopeful results have recently been obtained from the administration of a mixture of the sodium salts of pentose nucleotides (prepared from nucleic acid) In severe cases 20 c. cm of pentnucleotide are intramuscularly injected, twice daily, for 3 to 4 days When the white cell count begins to rise, the dose is reduced to 10 c cm In less severe cases 10 c cm of the drug is injected twice daily for a week The total and differential white cell counts should be done daily to note the progress of the disease during the course of treatment Clinically, cases have been found to improve after such treatment No untoward effects are known to follow the intramuscular injections of the drug

Local treatment of the oral lesions include gargles with hydrogen peroxide, sprays with potassium chlorate and swabbing with a solution of copper sulphate (10 gr to an ounce)

2. Allergy

The word allergy is derived from two Greek words meaning other energy Von Pirquet coined the term allergy to indicate an altered reaction in man to foreign proteins and implied that an antigen—antibody reaction was its basis in general Later, the meaning of the term was extended to indicate all forms of hyper sensitiveness to foreign proteins whether any antigen antibody reaction was present or not Allergy has now come to mean 'exaggerated susceptibility to various foreign substances or physical agents that are harmless to the great majority of ordinary normal individuals' The reaction appears after inhalation, ingestion, injection or skin contact of minute quantities of the substances in question and differs from any toxic action the substance might produce in large doses This hypersensitiveness may be spontaneous or may be induced as a *Definition*

serum sickness Allergy differs from anaphylaxis which is the term applied to manifestations of hyper sensitivene
is always induced and is always due
sensitiveness may be manifested at di
manifestations are given different names Thus in the respiratory tract we have paroxysmal rhinitis hay fever and asthma *in the skin urticaria giant urticaria* dermatographia and dermatitis venenata etc in the gastro intestinal tract certain forms of gastritis and vomiting enteritis diarrhœa and mucous colitis in the *nervous system migraine* and certain cases of epilepsy Bray considers that certain forms of enuresis are allergic in origin

The offending substance or substances may be introduced into the body from outside or may be produced in the body itself Thus it may be inhaled as in hay fever and pollen asthma may be ingested as in food and drug allergy may be injected as in serum sickness or may be brought in contact with the skin as in dermatitis venenata and urticaria or it may be due to physical agents such as heat and cold A small group of allergic manifestations may be ascribed directly to insect bites and stings When produced in the body the offending substances *may originate in an infective process within the body or it may owe its origin* to some pathological condition of the gut It appears that infective foci whether *of teeth tonsils sinuses bronchi etc liberate a substance which circulates and* sensitises various tissues and is capable of producing symptoms in either skin respiratory or gastro intestinal tracts In the cases dependent on some patho *logical conditions of the gut the substance or substances in question either result* from the bacterial action on the protein or the proteins are broken down in some abnormal fashion and the altered protein gains access to the circulation In the tropics the allergy secondary to some pathological condition of the gut is much more important than any other form of allergy This is probably due to a lowering of the defence mechanism of the liver caused by intestinal amœbiasis or some other condition causing hepatitis That the detoxicating and proteopexic functions of the liver are defective in cases of allergy has been shown by *Barber and Orial* who have found important biochemical changes in the blood and the urine of allergics

DIAGNOSIS 1 *History* In cases of suspected allergy it is essential to go carefully into the history of the patient Careful enquiries may elicit many points of great diagnostic value in allergic conditions (*a*) Most allergic conditions commence early in life It is important to find out the age at which the patient first noticed the onset of the condition (*b*) A history of inheritance is commonly found in allergic cases (*c*) Season of onset and the seasonal variations in the *disease are of importance* This may give a clue to the offending flowers and foods etc (*d*) There is a regular periodicity in the early stage of allergic conditions If they are severe and persist for several years they tend to become *continuous* (*e*) *Association of the disease* with some particular place food or animal may be elicited Particular attention should be paid to the surroundings at home and work such as presence of factories and stables near at hand presence of or association with *pets and poultry horses or cows presence* of pillow cases stuffed with chicken feathers etc As regards food at times the provocative articles of diet can be named by the patient but in the majority of cases he has to be carefully dieted before any food can be incriminated

2 *A total and differential blood count* is made most of the allergic patients have a high blood eosinophilia

3 *Protein skin tests* are often of value in confirming the diagnosis when a careful history makes it possible to discover a specific substance responsible for

the patient s symptoms When no clue is afforded by the history at all we turn to the routine protein skin tests for help These tests are based on the fact that those substances which when inhaled ingested or taken into the body by any other means are capable of producing allergic symptoms will also produce an urticarial wheal when brought in contact with the lower layers of skin

The dermal tests are usually done on the forearm The forearm is carefully cleansed with alcohol and scratches are made on it transverse to the long axis of the arm The scratches are made only 1/8th of an inch in length and they are made without drawing blood One spare scratch is made to serve as a control. A drop of N/10 sodium hydroxide solution is put on each scratch and the substance to be tested is rubbed into them one substance into one scratch the control scratch receives no substance After fifteen to twenty minutes the test fluid is wiped away and results are read by comparing the site of each scratch with the control A positive result is denoted by the appearance of an urticarial wheal at the site of the scratch The material for testing can be purchased ready made or can be made in the laboratory

The supernatant fluid obtained by macerating a small amount of the substance in a small quantity of N/10 sodium hydroxide solution can be used for the test

4 The best proof of a substance being responsible for the allergic symptoms of a patient is that the substance when brought in contact with the patient should precipitate an attack.

5 In most of the cases of allergy a hypodermic injection of 1/1000 solution of adrenalin hydrochloride relieves the symptoms and this forms a good therapeutic test

6 *The ether reaction for proteoses in urine* Oriel has described a reaction that occurs with great frequency during allergic conditions If the urine from cases of allergic and febrile diseases is acidified with sulphuric acid and shaken with a fifth of its volume of ether the ethereal layer formed on standing instead of being clear as in normal people becomes opaque and has a waxy appearance In strongly positive cases the tube may be invered without spilling the contents

c *Examination of stools* The allergic cases secondary to gut infection may sho *Entamœba histolytica* infection or the presence of the ova of various helminths The McConky neutral red lactose agar plate may show various non lactose fermenting bacilli causing postdysenteric lesions These findings are rather important from the treatment point of view

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che ... which renders an asthmatic subject liable to an attack of asthma from stimuli which in a normal person would produce no response

Barber and Oriel have found that the amino-acid content of the blood is raised during acute paroxysms of allergic manifestations and blood chlorides seem to be markedly diminished Similar changes have been found in urine, immediately before and during the paroxysms there is a decrease in urinary output accompanied by an increase in free acid and ammonia and diminution in chloride excretion Following the paroxysm the quantity of urine is increased and the urine becomes less acid or even alkaline and contains excess of chloride.

Tuberculin Treatment by tuberculin is specially recommended by Van Leeuwen The success does not depend on the specific action of tuberculin but on the local reaction produced by the injection of tuberculin A von Pirquet tes ... the degree of cons

In other cases the commencing does can be ...
a mgm

Allergic Diseases These are, arthritis and dermatitis of allergic origin anaphylaxis and serum sickness, asthma, hay fever, urticaria, etc Anti-histaminic drugs are used in the treatment of allergy on the basis of histaminic theory It is considered that these drugs displace histamine from the cell receptor or protect the cell so that histamine is not effective There are a number of these drugs ...

chlorcyclozene, thephorin

Some of these drugs are more effective than others and some are effective in certain diseases and certain patients The dose ranges from 25 mgm to 100 mgm Start should always be made with a small dose by the mouth every 4 hours as required Benadryl and pyribenzamine have a sedative effect also and may be given at bed time These drugs and particularly the last mentioned two may produce side effects, e g, sleeplessness, confusion, headache, nausea vomiting, diarrhoea, palpitation, vertigo, excitement, etc

The use of these drugs is only palliative and does not exclude proper ... and treatment by eradication of cause These drugs are useful in hay ... nsitization is necessary
... itization to endogenous and exogenous fore gn substances, e g, serum, antibiotics such as penicillin or streptomycin foods bacterial infection of sinuses, teeth, etc

Genito urinary conditions due to allergy show frequency of urination burning tenesmus dysmenorrhoea, leucorrhoea, genital irritation, etc

Food allergy has been described. The following common foods give rise to allergy in sensitive individuals

1 Eggs, fish, nuts, tomatoes, cheese, etc
2 Ginger, cabbage, pineapple, pepper, etc
3 Beer, chickens, lime, wheat, milk

Antihistaminic drugs give symptomatic relief and are useful in these conditions in doses of 25 to 50 mgm

Physical allergy This is hypersensitivity to light, heat, cold, trauma, etc Most common response is urticaria Allergy due to cold may be either localized or generalised Treatment is difficult Large doses of calcium gluconate intravenously have been used as well as other calcium preparations Histamine 0 1 mgm in 250 c cm of saline intravenously has been tried Desensitization may be tried Antihistaminic drugs may also be used Adrenaline 0 5 c cm subcutaneously or ephedrine 24 mgm (3/8th of a grain) have given good results

Anaphylaxis Drugs such as sulphonamides and penicillin have been shown to produce symptoms of anaphylaxis as shown in serum sickness (fall in blood pressure, weak rapid pulse, dyspnoea, general involvement of joints, etc) This is probably due to their combining with human serum and forming conjugated

proteins which have produced sensitization The condition can best be treated by subcutaneous injection of 0 5 c cm. of 1 in 1,000 adrenaline every 3 or 4 hours Antihistaminic drugs such as benadryl or pyribenzamine also give relief

Some foods have also produced anaphylactoid symptoms Adrenaline is useful in this condition, also 0 4 mgm (1/50 gr) of atropine sulphate given hypodermically relieves symptoms Food responsible for producing symptoms should be determined and eliminated

Serum sickness The reaction is due to use of heterologous serum, e g, antitoxic serum from horse injected into man With the advent of toxoid, refined serum and chemotherapy such reactions are becoming less common now

3 Angina Pectoris

Angina pectoris may be defined as disturbance of the cardiovascular system with severe substernal pain and generally associated with a sense of oppression or constriction which may reach a high grade of intensity and intolerable anguish It is associated with other symptoms such as a sense of impending death and an acute misery accompanied by varying vasomotor disorders such as cold sweats and deathly pallor Angina is common in families associated with an inherited tendency to arterial diseases and hyperpiesia It is commonly seen in persons of middle age and is commonest in males between the ages of 50 to 70 Good living, lack of sufficient exercise and excessive mental strain are predisposing factors of angina Diabetes is an important element factor [illegible] of the high [illegible] *Etiology*

physiological nature due to improper nutrition of the heart from organic defect or from temporary spasm Angina is rarely seen in cases of mitral stenosis and where the auricles are fibrillating The substernal discomfort or pain is induced by effort and is relieved by rest The three cardinal symptoms of angina are pain, a fear of impending death and disturbance of respiration Pain also has certain lines of radiation the commonest of which is the left arm Physical examination is generally disappointing in the diagnosis of the condition A sudden death might ensue from coronary thrombosis In the hyperpietic group, vascular accidents such as cardiac failure or failure of renal functions may cut life short The prognosis is grave in families predisposed to angina and essential hyperpiesia *Symptoms*

An electrocardiogram may yield helpful information A low voltage in all leads the presence of a branch bundle block, or an abnormal Q R S complex, or evidence of a previous coronary thrombosis, would be an unsatisfactory finding suggesting the presence of myocardial damage and to that extent adding precision to the prognosis

Treatment Absolute rest is imperative on the slightest sense of substernal discomfort If the pain does not subside with rest, one or more tablets of trinitrin should be chewed slowly If this fails to yield relief, the inhalation of amyl nitrite is indicated If such drugs cannot alleviate the intense pain, morphine may be injected in doses large enough to make the patient comfortable *Treatment*

If, however, the pain proves very resistant and recurs with increasing intensity in spite of rest and opiates, a coronary thrombosis should be suspected In the less severe attacks, flatulence may be a distressing symptom, and this may be relieved by brandy or a strong carminative draught containing menthol 8 gr aromatic spirit of ammonia, compound tincture of cardamom and tincture of ginger, each 1 oz , two teaspoonfuls of this mixture to be given in four tablespoonfuls of water In cases of frequent recurrent attacks, a mixture containing opium and chloral, given twice daily, may diminish this tendency In the angina associated with aortic regurgitation, nocturnal attacks are common In these cases a draught of opium and chloral taken before retiring to bed proves effective General treatment in these cases is based on the recognition that the circulation through the coronaries is defective and that this defect is permanent and irremediable Reliance, therefore, must be placed on a change in the mode of life rather than on drugs A careful investigation should be made not only into the physical condition of the patient, but also into his mode of life and environment, in order to discover the extent of the organic damage Exercise is advisable to keep the heart muscle fit and walking serves this purpose As the condition advances, the amount of exercise which can be indulged in with comfort gradually diminishes Under no circumstances should any sudden or severe physical effort be made A short rest after even the lightest meal should be insisted upon With diminution of the cardiac reserve, many patients find comfort and benefit in retiring early to bed at night Diet is important, meals should be small, the *food simple and easily digestible and a minimum of fluid should be taken with* the meal Obesity should be controlled with strict dietary measures as it often leads to fatty degeneration of the myocardium Constipation and flatulence should be avoided In all cases, the examination of blood for a Wassermann reaction should be a routine procedure, search should be made for all foci of sepsis in the body, and hyperpiesia if present, should be controlled Large doses of ammonium bromide, 20 gr twice or thrice daily, are undoubtedly helpful in *calming down patients with mental worries.* Chloral hydrate 10 gr twice daily, [illegible]

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Arthritis in glanders The joint is infected with *Bacillus mallei* and arthralgia and suppurative arthritis are the forms seen in the disease

Septicæmic and pyæmic arthritis Acute arthritis leading to suppurative changes in the joint is a common complication in septicopyæmic condition of the blood infected with staphylococci streptococci and other pyogenic organisms

Filarial arthritis Among other complications synovitis suppurative arthritis and fibrotic ankylosis of joints are seen in the course of the disease

Arthritis in guinea-worm disease Sometimes a female dracunculus penetrates a joint and causes synovitis or arthritis

Arthritis in leprosy In leprosy, joint involvements present a clinical picture identical with Charcot s joint in tabes dorsalis

Arthralgia and arthritis are also seen as complications in relapsing fever

(c) *Arthritis in gout* The joint never completely recovers after recurrent attacks of arthritis resulting in permanent pathological deformities

(d) *Arthritis following the injection of animal sera* Arthritis is a common complication in serum sickness and anaphylactic attacks after serum administration

(e) *Arthritis of neuropathic type* Various pathological changes of bones and joints are met with due to trophic changes associated with tabes dorsalis and syringomyelia Complete absence of pain in the diseased joints is the predominant feature in such cases

(f) *Arthritis due to abnormal blood conditions* (i) *Hæmophilia* Hæmorrhage into joints *with or without an exciting cause and the resulting* arthritis are common in the disease (ii) *Purpura* Arthralgia in purpura simplex and arthritis *with effusion in joints in purpura rheumatica are the common* accompaniments in the disease

(g) *Arthritis associated with deficiency diseases* Hæmorrhagic effusions into joints in scurvy and pathological changes of the structures of a joint in rickets are commonly met with

2 Arthritis of obscure causation (a) *Acute rheumatism* Here arthritis is one of the diagnostic symptoms in the disease

(b) *Non specific infective arthritis* This includes all the chronic types of arthritis with obscure ætiology though infection is held to be a factor in its causation and known as rheumatoid arthritis arthritis deformans osteo-arthritis and chronic villous arthritis

The ætiological factors of arthritis of known causation are the same as those causing such disease but the factors responsible for the non specific type are *generally obscure* [illegible] improper diet exposure to cold nervous or [illegible] portant *role in the ætiology* [illegible] muses genito urinary passages is held by the modern school to be a most potent factor *in the ætiology* of chronic infective arthritis

Treatment Burbank (1930), in all cases suggests a good plan for a thorough investigation of the physical and biochemical *conditions of the patient* before the rational treatment is commenced Cultures of organisms isolated from suspected *infective foci* in the system are made *A complete* bacteriological examination of urine and stool with subsequent identification of all unusual organisms is undertaken in each case In *every case* blood is taken as for Wassermann s test gonococcus fixation and titration against polyvalent antigens of *Streptococcus viridans, S hæmolyticus* and the slow hæmolising type

Staphylococcus aureus Esch coli and also against thirty five strains of streptococcus isolated from known active foci in arthritic cases A blood culture is also done in all cases

The patient s general health should be kept in the best possible state A search to find out the infective foci in the body as in the teeth tonsils sinuses
genito urin
for their
stomach ar
and bladder is to be always encouraged by physical therapy and drugs Trauma
n all fo ms sho ld be caref ll avo d mplete nd perfect re t both general

General trea

Local treatment and physical therapy Physical methods of treatment in rheumatic and other joint affections have been found to be most effective in general practice and sometimes better results have been obtained than with drug treatment These methods improve the general health of the patients thus increasing their resisting power both by direct action and indirectly by causing auto-inoculation In most cases pain is relieved swelling and stiffness reduced and deformity corrected

Local treatn

The idea of local treatment is to improve the circulation of the affected part This is effected by physico therapeutic measures—Radium heat ionisation massage exercise diathermy heliotherapy—all are invaluable The affected part should have perfect rest in the acute and subacute stage when active inflammation is present Resting a joint by splints elastic bandages and other orthopædic appliances in the acute stage to prevent subsequent deformity should always be borne in mind The beneficial effects of physiotherapy are due to cutaneous vasodilatation generalized sweating and pyrexia whereby the unhealthy state of the skin improves and pain and stiffness of muscles are considerably reduced Most simple and valuable form of thermal treatment consists of the old fashioned hot wet pack made of blankets wrung out of hot water A pack is given daily for ten days No form of thermal treatment is complete unless followed by general deep massage Diathermy is a good source of heat whilst if there be much effusion ionisation with other drugs is useful Only when the acute stage subsides gentle massage and graduated exercise to preserve the integrity of blood circulation electrotherapy in form of Faradism sinusoidal current or interrupted galvanism necessary for restoring the function of the part should be adopted Any form of exercise which will leave the part painful and tired half an hour after the cessation of the act should never be encouraged Deep X ray therapy relieves pain in osteo arthritis

Diet therapy Regulation of diet depends on the patient s general condition of health weight chemical examination of blood and general clinical progress The basic diet should be of low caloric value with low carbohydrate protein and purine values but of adequate vitamin content.

In the acute stage of the disease the patient should live on glucose and fruit juice and no liberal diet should be allowed till the acute symptoms subside Persons with atrophic and hypertrophic arthritis have definitely improved on low caloric diets with reduced food intake. Reduction of carbohydrates with adequate substitute of proteins and fats is useful

sometimes met with The causes are —(1) rupture of ectopic gestation, (2) rupture of the spleen, (3) rupture of aneurysm, (4) new growth, (5) result of *previous tapping, and (6) tuberculosis*

Characters of ascitic fluid The characters vary according to the causes at work Thus, when there is inflammation of the peritoneum (exudates) the specific gravity and amount of contained protein are higher than when ascites is associated with back pressure (transudates) Serous ascitic fluid is clear, transparent and greenish or faintly yellow in colour The reaction is alkaline, and the specific gravity under 1012 in mechanical effusions or hydroperitoneum and 1018 or higher in exudations *in sub acute or chronic peritonitis The amount of solids* and proteins varies In simple effusions due to renal disease there may be only 0 3 per cent or less of protein, while in inflammation the amount may be 4 per cent In jaundiced patients the fluid contains bile pigment The cells seen on *microscopical examination vary in different kinds of ascites In ascites* due to mechanical causes, *e g*, heart disease and hepatic cirrhosis, endothelial cells are predominant, in tuberculous peritonitis small lymphocytes are present in high percentage and this is also found in the ascites due to intra abdominal syphilis and malignant disease In inflammatory conditions polymorphonuclear cells predominate in the ascitic fluid

The ascitic fluid at the first tapping is usually sterile but as a result of paracentesis infection may occur The colon bacillus and the tubercle bacillus are sometimes present

There may be a positive pressure inside the abdomen Pitres found that it may vary between 30 and 6 mm of mercury (average 12 mm) This positive intra abdominal pressure varies with respiration and is associated with increased pressure in the portal vein and low arterial pressure (Gilbert and Weil)

Treatment The underlying cause should be looked for and treated adequately The palliative treatment consists of measures towards removal of fluid Low salt intake ammonium *chloride 3 gm (45 gr) daily and mercurial* diuretics are indicated *Paracentesis* It is indicated in the presence of any distress and pressure symptoms *Diuretics* Their use should not be persisted in when there are indications that paracentesis is necessary They act well after paracentesis which relieves the *pressure on the renal veins Good results have* been obtained by injections of salyrgan intramuscularly or intravenously in conjunction with ammonium chloride and a salt free diet

Surgical measures (Talma Morrison s operation) have been advocated

6. Asthma

The term 'asthma' derived from a Greek word meaning *'panting'* is applied ... *with prolonged expiration and wheez*

... assified into two main groups —

1 *Secondary to infection or disease of the respiratory tract, i e*, nose throat, trachea and bronchi This group includes a majority of cases amongst Indians

(a) *Nasal reflex* In this type the total leucocyte count is more or less ... and the Arneth count is normal The cases that ... In such cases

(b) *The cases in which the attacks are due to pressure of the enlarged hilar glands on the vagus nerve* In such cases there is no increase in the number of

otal leucocytes or eosinophiles and the Arneth count is more or less normal The
X ray picture will show enlarged hilus glands

(c) *Bronchial cases due to infection in the bronchi* These cases are subdivided into two groups (i) Gram negative bacilli cases Total leucocyte count is high, there is marked eosinophilia and a shift in the Arneth count to the left A smear of the sputum shows Gram negative bacilli resembling pneumobacilli The sputum is cultured and non motile bacilli belonging to the Eberthella group are isolated A vaccine is made from these organisms and is used for treatment. (ii) Bronchial cases in which the infection is due to the ordinary organisms causing bronchitis Total leucocyte count may be high or low, there is no eosinophilia but there is a marked shift in the Arneth count to the left In such cases cultures from the sputum are made to get the strains for preparations of an autovaccine An X ray examination of the chest and a Von Pirquet s test should be done to exclude tuberculosis

Bronchial Asthma

2 *The allergic cases* These cases may be divided into three groups —

(a) *Local allergy of the mucous membrane to foreign substances such as dust* These cases may be congenital or may be acquired as a result of the previous disease of the bronchi The congenital cases are rare amongst Indians but common amongst Europeans In India the condition is more often acquired as a result of previous bronchitis or may develop during the asthmatic state This type is common amongst the jute workers and textile workers and in certain occupations where there is a large amount of dust in the atmosphere The dermal tests are of value in diagnosing these cases These can be treated with extract made from the dust, the treatment is carried out by giving graduated doses of the sterile dust extract.

Allergic cases

(b) *Hereditary allergy, i e*, susceptibility to animal emanations etc These cases are rare in India Dermal tests are of value in the diagnosis of such cases The treatment consists in avoiding the excitant or in desensitizing against it

(c) *Allergy due to internal toxins* This can be subdivided into two groups, firstly it may be due to some rare or common food or foods Dermal tests are useful in the diagnosis of these cases but this type is rare amongst Indians Secondly allergic symptoms secondary to bowel disease occur, these are much more
nal tests are of no value as either all the tests
ive positive results These cases have to be
treatment of allergy of alimentary origin

two groups—bror
For example if a
of the bronchi be
will present a m
marked shift in t
as an abnormal
repeated turgescence of the membrane and its lowered resistance leads to bacterial infection of the mucous membrane and the bronchial glands may become enlarged due to this infection

DIAGNOSIS. In an acute attack a detailed examination of the patient is hardly needed to make a diagnosis The characteristic posture and the wheezing respiration are quite typical The patient sits up with the back hunched the sternum bulging out and the shoulders raised to the utmost

Clinically an asthmatic attack may simulate an attack of dyspnoea of cardiac and renal origin The consideration of a few points will usually make the

sometimes met with The causes are —(1) rupture of ectopic gestation, (2) rupture of the spleen, (3) rupture of aneurysm, (4) new growth, (5) result of previous tapping, and (6) tuberculosis

Characters of ascitic fluid The characters vary according to the causes at work Thus, when there is inflammation of the peritoneum (*exudates*) the specific gravity and amount of contained protein are higher than when ascites is associated with back pressure (transudates) Serous ascitic fluid is clear, transparent and greenish or faintly yellow in colour The reaction is alkaline, and the specific gravity under 1012 in mechanical effusions or hydroperitoneum and 1018 or higher in exudations in sub acute or chronic peritonitis The amount of solids and proteins varies In simple effusions due to renal disease there may be only 0 3 per cent or less of protein, while in inflammation the amount may be 4 per cent *In jaundiced patients the fluid contains bile pigment* The cells seen on microscopical examination vary in different kinds of ascites In ascites due to mechanical causes, *e g*, heart disease and hepatic cirrhosis, endothelial cells are predominant in tuberculous peritonitis small lymphocytes *are present in high* percentage and this is also found in the ascites due to intra abdominal syphilis and malignant disease In inflammatory conditions polymorphonuclear cells predominate in the ascitic fluid

The ascitic fluid at the first tapping is usually sterile but as a result of paracentesis infection may occur The colon bacillus and the tubercle bacillus are sometimes present

There may be a positive pressure inside the abdomen Pitres found that it may vary between 30 and 6 mm of mercury (average 12 mm) This positive intra abdominal pressure varies with respiration and is associated with increased *pressure in the portal vein and low arterial pressure* (Gilbert and Weil)

Treatment The underlying cause should be looked for and treated adequately The palliative treatment consists of measures towards removal of fluid Low salt intake, ammonium chloride 3 gm (45 gr) daily and mercurial diuretics are indicated *Paracentesis* It is indicated in the presence of any distress and pressure symptoms *Diuretics* Their use should not be persisted *in when there* are indications that paracentesis is necessary They act well after paracentesis, which relieves the pressure on the renal veins Good results have been obtained by injections of salyrgan intramuscularly or intravenously in conjunction with ammonium chloride and a salt free diet

Surgical measures (Talma Morrison's operation) have been advocated

6 Asthma

The term 'asthma' derived from a Greek word meaning *'panting'* is applied to a type of paroxysmal dyspnœa associated with prolonged expiration and wheezing respiration

For purposes of treatment it can be classified into two main groups —

1 *Secondary to infection or disease of the respiratory tract, i e*, nose throat, trachea and bronchi This group includes a majority of cases amongst Indians

(*a*) *Nasal reflex* In this type the total leucocyte count is more or less normal, there is no eosinophilia and the Arneth count is normal The cases that respond favourably to aspirin will be benefited by a nasal operation In such cases an examination of the nose and paranasal sinuses is carried out

(*b*) *The cases in which the attacks are due to pressure of the enlarged hilar glands on the vagus nerve* In such cases there is no increase in the number of

total leucocytes or eosinophiles and the Arneth count is more or less normal The X-ray picture will show enlarged hilus glands

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(b) *Hereditary allergy, i e*, susceptibility to animal emanations, etc These cases are rare in India Dermal tests are of value in the diagnosis of such cases The treatment consists in avoiding the excitant or in desensitizing against it

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There will ... two groups—bronchial and allergic—but which are a mixture of the two types For example if a case starts as a bronchial case but later the mucous membrane of the bronchi becomes hypersensitive to dust, etc, as a result of the disease it will present a mixed blood picture high leucocytosis, high eosinophiles and a marked shift in the Arneth count to the left Similarly, in a case which starts as an abnormal sensitiveness of the mucous membrane to external stimuli the repeated turgescence of the membrane and its lowered resistance leads to bacterial infection of the mucous membrane and the bronchial glands may become enlarged due to this infection

DIAGNOSIS In an acute attack a detailed examination of the patient is hardly needed to make a diagnosis The characteristic posture and the wheezing respiration are quite typical The patient sits up with the back hunched the sternum bulging out and the shoulders raised to the utmost

Clinically an asthmatic attack may simulate an attack of dyspnœa of cardiac and renal origin The consideration of a few points will usually make the

Management of the asthmatic attack Medicinal treatment P experience of the patient is usually sufficient to tell which of the drugs a A P C powder or adrenaline will *prove most beneficial to him* When r

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these acts a morphine atropine injection is to be given

A subcutaneous injection *of 1/150th gr of atropine* is given at the o the attack The patient will be *relieved if the attack is due to a broncho-c*o tion brought about by reflex stimulation *of the vagus The drug is* indicated in the presence of emphysema The dryness it produces is a dra because thereby it may *increase the cough*

Adrenaline must always be given intramuscularly It is of no value given orally, because *it is inactivated* by gastric and intestinal secretion intracutaneous *injection of* adrenalin is very painful and the effects of its venous injection are very unpleasant Violent headaches, severe vertigo p tion, tremor, breathlessness *precordial* pain nausea and vomiting may re adrenaline enters into a vein Adrenaline acts by stimulating the symp *nervous system* and by shrinking the œdematous mucous membrane lin *bronchioles* The smallest effective dose of the drug should always be em *so that relief is* obtained without unpleasant by effects The earlier the in *is given at the beginning* of an attack will usually control the symptoms w large doses late in the paroxysm may fail to do so For this *reason many* w advocate teaching the patient the use of a hypodermic syringe so that he c *the benefit of small* doses of the drug at the outset of the attack It is qui *to do this* because adrenalin is not a habit forming drug

Hurst advocates a continous methods of adrenaline injection in *asthmaticus* where severe asthma has continued uninterruptedly for days or Intramuscular injection of 1 c cm of 1 in 500 epinephrine in oil twice may obviate the use of continual medication Ephedrine can be used in pl adrenaline, but it is of use only in mild cases or as a preventive Ephedri

is maticus

be given orally and its effect is prolonged for several hours though it is r prompt in action as adrenaline The sulphate and hydrochloride of ephedri *available Dosage* for an adult is *3/8* to *3/4* gr 1/8th gr for a child unde year of age and 1/4th gr above one year Ephedrine may also be given cutaneously but this has got no advantage over a subcutaneous injectio adrenaline

Besides ephedrine pseudo ephedrine, another alkaloid obtained from eph has been used in these conditions Chopra and his co workers (1931) state the broncho dilator action of the drug appears to be quite as marked as th ephedrine without the unpleasant side effects of the latter Tincture o *vulgaris* which contains both the alkaloids may be used in doses 10 to 30 mi

Morphine is a valuable drug for controlling a severe attack when measures have failed It should be used only as a last resort in asthma should be combined with atropine

A mixture containing potassium iodide and antispasmodics such as lo stramonium belladonna and kuth is given during and between attacks Io liquefy the bronchial secretions and make the cough more effective

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usually control attacks Fifteen minims of a saturated solution of potassium i three times a day is valuable In moderately severe cases complementary of 60 mgm (1 gr) of phenobarbital and 0 5 c cm of 1 in 1000 adrenalin subcutaneous injection and repeated if necessary after 2-4 hours give r

Aminophylline in doses of 0 5 gm (7½ gr) may be more effective than adrenaline this may also be repeated 2-4 times a day In severe attacks 0 5 to 1 0 c cm of adrenaline by injection and 0 5 gm (7½ gr) of aminophylline by mouth may be given repeatedly Saturated solution of potassium iodide may be given on every 3 or 4 hours

The patients with status asthmaticus are adrenaline resistant and in these paroxysm may last for days Penicillin and some time streptomycin in usual doses may give relief if there is associated infection as indicated by fever and muco purulent sputum. Penicillin inhalations may be tried Antihistaminics are not much use but some time benadryl combined with adrenaline may be helpful Intravenous injection of 50 c cm. of 50% per cent glucose may produce a dramatic effect Aminophylline may be given intravenously Inhalation of ether by drop method or anaesthesia by avertin or cyclopropane may give relief

General treatment of the attack A good purgative is given in the beginning and then the bowels are kept open by mild saline laxatives A loaded sluggish bowel tends to retard recovery hence it is essential that the patient should not be allowed to remain constipated In patients with a distended stomach an emetic affords great relief It relieves the stomach distension and loosens the mucus in the lungs In children emesis may be induced by tickling the throat Taking a large dose of sodium bicarbonate or ordinary salt in a glass of water also serves the same purpose Large doses of vinum ipecacuanha or a hypodermic injection of 1/10 gr apomorphine hydrochloride may have to be used

No food should be given for twenty four hours plenty of water and hot weak tea should be allowed in this period In cases of exhaustion stimulants are indicated With the subsidence of symptoms a simple, soft and easily digested diet should be allowed The patient should be allowed to choose those simple foods which he has by experience found to be harmless

Treatment of asthmatic state Treatment between the attacks has for the most part been indicated while describing the types of asthma A few additional remarks are however needed The patient should be thoroughly overhauled and any infective focus found or any endocrine dysfunction discerned should be adequately treated Injections of arsenical preparations such as soamine are used to tone up the endocrine system

The allergic cases in which no definite offending cause is found may be treated by means of non specific desensitisation as described under treatment of allergy

(3) Gastric distension commonly precipitates an attack so that late and heavy meals should be avoided To avoid flatulent dyspepsia the food should be thoroughly masticated and any errors in gastric secretion should be corrected For hypochlorhydria administration of hydrochloric acid by mouth may suffice or a daily gastric lavage may have to be done to treat the underlying chronic gastritis *Gastric distension Asthma*

Potassium iodide mixture along with antispasmodics such as lobelia stramonium belladonna tinture ephedra and kuth is regularly given for some time It is usual to add arsenical solution to the mixture Arsenic is said to have a favourable influence on bronchitis and asthma when given over long periods Barty recommends the following mixture for children—Potassium iodide 2 gr arsenical solution 1 min tincture of stramonium 3 min with 10 min, of syrup Patients suffering from irritating nocturnal cough derive benefit from a dose of linctus at bedtime, linctus paregoric may be used or the following may be given tinct of stramonium 15 min syrup pruni verg 1 dr and syrup codeine phosphate 1 dr

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Briefly in a mild attack 1 in 100 spray or subcutaneous injection of 0 3 c cm of 1 in 1000 adrenaline or epinepherine will suffice Ephedrine 25 mgm (3/8 gr) with 8 mgm (1/8 gr) of phenobarbital and 0 12 gm (2 gr) of theophylline usually control attacks ... odide three times a day is ... use of 60 mgm (1 gr) o ... by subcutaneous injection and repeated ... ref

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A passing reference may here be made to asthma powders cigarettes sprays etc Stramonium leaf is the main constituent of most asthma powders and cigarettes it is mixed with saltpetre to aid its combustion In some patients these act as preventives and help to cut short mild attacks but to many patients the *fumes are annoying irritate the mucous* membranes of eyes nose and throat and induce severe cough Most sprays contain either atropine in some form cocaine or adrenaline and some chronic asthmatics get transitory relief from these sprays Powders cigarettes and sprays have no place in the treatment of acute attacks

Breathing exercises are essential specially to remedy any deformity of the chest which might have resulted from the repeated attacks The patient is in the habit of using the upper part of his chest for respiration and the exercises are designed to teach him to use the lower part of his chest and the diaphragm

7 Blood in Health and Disease

Composition of blood Blood contains plasma and celluar elements Plasma includes serum and fibrinogen which yields fibrin on clotting Serum contains serum albumin serum globulin glucose calcium salts sodium and potassium chlorides carbonates phosphates etc. The cellular elements consist of red cells white cells (fibrin ferment) blood platelets hæmoconin The red cells contain oxyhæmoglobin lecithin and salts (Webster and Koch)

The blood volume In adults the blood volume is 5 to 5½ litres (10 to 11 pints) or one fifteenth to one-thirteenth of the body weight Blood volume is increased in pregnancy just before term hypertension and in anasarca accompanying card ac insufficiency Decreased total volume occurs when there is excessive loss of fluid as in polyuria diarrhœa profuse sweating etc A loss of 350 c cm. of blood in an adult has no appreciable effect on the blood pressure with the next 350 c cm loss a slight but definite depressor effect results, if the loss reaches 1 750 c cm the fall of blood pressure is very marked

Viscosity of the blood The viscosity of blood is compared with that of water ... ing through tubes ... to their internal ... ning viscos ty of ... les and 3 9 to 4 9 for females and of serum from 1 7 to 2 for both sexes

The viscosity of blood depends on (1) the cell volume an increased cell volume increases the viscosity *and white cells are more viscid than red cell (2) the hæmoglobin content* an increased hœmoglobin content causes an increase in viscosity, cyanosis increases the viscosity and venous blood is more viscid than arterial (3) the protein content dehydration by increasing the protein content increases viscosity General œdema or anæmia which lowers the protein content also lowers the viscosity of blood ...

... viscosity of blood is increas ... and a greater load is thrown on the heart The cell concentration and viscosity give optimum efficiency with the minimal heart work when the cell volume lies between 40 and 50 per cent of the blood volume

PHYSICAL AND CHEMICAL CHARACTER (Values are in mg per 100 c cm whole blood unless otherwise noted)

Specific gravity	1,056 to 1,066 (1·026 to 1 032 for serum, 1 090 for corpuscles)
Reaction	pH 7.3 to 7 4
Total solids	19 to 23 per cent
Hæmoglobin	14 to 18 per cent (by weight)
Serum albumin	4 6 to 5 3 per cent.
Serum globulin	1 8 to 2 7 per cent
Fibrin	0.2 per cent
Total nitrogen	2 6 to 3 5 per cent (plasma, 0 6 to 1 1)
Nonprotein nitrogen	25 to 35 (plasma, 20 to 35)
Urea	20 to 40
Urea nitrogen	12 to 15 (plasma 10 to 23)
Amino-acid nitrogen	6 to 8 (plasma, 4 to 7)
Ammonia nitrogen	about 0 1
Uric acid (Folin-Wu method)	2 to 3 (extremes, 1 to 3 5) (plasma 2 5 to 5)
Creatinine	1 to 2 (plasma, 0 8 to 1 5)
Creatine	3 to 5 (plasma, 0 to 3 8)
Sugar (Folin Wu method)	90 to 120 (same for plasma)
Chlorides (as NaCl)	450 to 500 (plasma 570 to 620)
Fat (Bloor's fat method)	about 600
Cholesterol (Bloor's method)	140 to 170
Lecithin (Bloor's method)	30 (plasma 22)
Acetone bodies	0 to 4
Bicarbonate (plasma)	53 to 77 vol per cent CO_2
Oxygen capacity	18 5 vol per cent
CO_2 tension (arterial)	about 40 mm Hg
Calcium	5 3 to 6 8 (serum or plasma, 9 0 to 11 0)
Magnesium	2 3 to 4 (serum or plasma 1 6 to 3 5)
Sodium	170 to 225 (serum or plasma 335)
Potassium	153 to 240 (serum or plasma 18 to 21)
Phosphorus total (as H_3PO_4)	about 120 (plasma 35 to 40)
Phosphates, inorganic (as P)	(serum) 3.2 to 4 3
Sulphates (as S)	0 5 to 1 0
Bilirubin	0 1 to 0 25

Leucocyte count Capillary blood from the fingers is generally made use of in the total count of white blood cells A large drop of blood is required for the purpose The blood is sucked into the pipette up to the mark 0 5 and the same is diluted with W B C fluid (glacial acetic acid 38 min mercuric

The pipette containing *Leucocyte*
nting chamber is used
This surface is exactly
a deep channel The
ruled area only and it

should not flow into the channel around For a leucocyte count the whole central ruled area containing 1 sq mm is used After placing the drop of blood on the counting chamber, one minute should be allowed to elapse for the cells to settle

All the cells contained in the 16 squares should be counted The corpuscles touching the upper and left side lines of the squares should be counted while those touching the lower and right sides should not come in the count Multiply the total of the cells by 312 Repeat the count and take the average of both counts This is the number of cells per cubic millimeter The new type of counting chamber with Neubauer ruling has got a distinct advantage over the Thoma Zeiss type There is less chance of overflow This type facilitates the counting of [illegible] The total count of the cells in the four squares [illegible] of leucocytes per cubic millimeter [illegible] decided advantage where the examination is not done at the bedside and the blood has to be sent to a distant place The bottle should be well shaken before counting The pipette is most easily filled from a large drop put on a glass slide

Differential count of white blood cells A small drop of blood from a puncture finger is placed near one end of a glass slide and with another slide or some other spreader it is spread over the glass slide The smear should not be very thin *Stains used* (1) Eosin and hæmatoxylin The slide is immersed in the vial containing the alcoholic solution of eosin for one to two minutes this is thoroughly washed with water The slide is then immersed in the other vial containing hæmatoxylin for three to five minutes It is again washed with water and then dried (2) Wright s or Leishman s stain About 10 to 15 drops of the stain are put over the glass slide and kept for two minutes The stain is then diluted by adding distilled water and is left for 3 to 5 minutes The whole is then washed off by flooding with water and then dried The differential count is done under an oil immersion lens of the microscope 200 white cells being counted and recorded by a tally system The percentage of each variety is then calculated

Leucocytosis Any increase in the leucocyte count to over 10 000 per c mm is considered a leucocytosis whether such an increase is due to a physiological or a pathological cause.

I *Physiologic leucocytosis* (*a*) In the new born the average count is 20 000 per c mm and as many as 25 000 per c mm are recorded During the first and second days of life the count falls but again rises by the end of the first week to 10 000 (*b*) In later weeks of pregnancy and during labour the count rises to over 30 000 per c.mm (*c*) After exercise convulsions or severe massage to about 12 000 per c mm (*d*) Digestive or alimentary leucocytosis *Hæmoclasic test* If the proteopexic function of the liver is impaired a protein meal will be followed by a reduction in the white cell count instead of by the usual digestive leucocytosis (*e*) From altered circulation Slight increase in the leucocyte count results from slowing of the blood stream or stasis Posture vasomotor influences and changes in temperature slightly alter the count

II *Pathological leucocytosis* is characterised by an altered ratio of all the types Generally the increased count is due to an increase in the neutrophilic granular leucocytes Such leucocytosis commonly occurs from infection by pyogenic cocci as in inflammatory conditions *viz* pneumonia appendicitis cellulitis etc Pertussis is marked by an increased number of lymphocytes

Leucocytosis is marked after the use of extracts from highly cellular organs adrenalin nuclein turpentine camphor antipyrine phenacetin digitalis pyrogallol salvarsan and after long continued chloroform narcosis

Leucocytosis is also marked in uræmia eclampsia acidosis intestinal obstruction burns and occasionally rickets Even toxic food or excess of alcoholic

beverages may cause a temporary increase in the leucocytes Leucocytosis is also the characteristic feature in leukæmia

Post hæmorrhagic leucocytosis is more marked when bleeding occurs in a serous sac or into a joint cavity and as many as 20 to 30 thousand per c mm are recorded In neoplastic conditions leucocytosis is more marked when metastasis in bone marrow takes place in cases of sarcoma and carcinoma and as many as over 40 000 per c mm have been recorded

Eosinophilia I *Physiological* In infancy up to 10 per cent (in Indians)

II *Allergic* (*a*) Bronchial asthma often slight occasionally as high as 20 per cent of 20 000 (*b*) Hay fever up to 10 per cent during the period of symptoms (*c*) Migraine inconstant and slight (*d*) Urticaria eczema and with positive tuberculin reaction *Causes of Eosinophil*

III *With parasitic infestations* (Possibly only another manifestation of allergy) (*a*) Infection with intestinal tænia (not constant) ankylostomes (up to 15 per cent of 10 000) ascaris oxyuris etc (far less constant) amœbic dysentery (inconstant) (*b*) In tissues trichina (20 per cent of 20 000 and higher) echinococcus (50 per cent of normal total count) coccidioidal granuloma (occasionally high 12 per cent of 22 000) filaria (less marked occasionally 15 per cent) and bilharzia

IV *Familial eosinophilia* is high and persisting but rare

[illegible] up to 85 per cent

[illegible] (up to 40 per cent

[illegible] ally high) psoriasis

VI *In diseases of the hæmopoietic system* Myelocytic leukæmia (1 to 5 per cent of high total count) the so called eosinophilic leukæmia (80 per cent of 100 000) Hodgkin s disease (usually trifling occasionally as high as 55 per cent of 25 000)

VII *With certain infections* (*a*) Cholera (4 to 16 per cent of normal total count gonorrhœa inconstant may be up to 12 per cent) scarlet fever (5 to 10 per cent of 20 000) and active tubercolosis (*b*) Post febrile *e g* after pneumonia (up to 13 per cent) measles varicella rheumatic fever and malaria (only slight)

VIII *In certain diseases of bone* Sarcoma metastatic carcinoma osteomyelitis rachitis osteomalacia osteitis deformans

IX *With various neoplasms* Rare but reported up to 30 per cent

X *In endocrine disorders* Addison s disease (6 to 10 per cent) ovarian disease (non suppurative non malignant) also reported with menstruation

XI *From certain chemicals etc* After administration of uncooked liver (up to 50 per cent.) following camphor pilocarpine phosphorus chronic copper sulphate poisoning etc

XII *After irradiation* Two to three weeks later (up to 20 per cent)

XIII *After splenectomy* After 1 month (up to 15 per cent for many months)

Lymphocytosis In children from the first two weeks of life up to five years the lymphocyte percentage is 40 to 70 Conditions usually accompanied by lymphocytosis are:—(1) Pertussis The average mature lymphocytes often constitute 60 or more per cent The maximum count is about 88 per cent during

the second week of the disease (2) Infectious mononucleosis The average lymphocytic count is about 70 to 80 per cent of the total count (3) Malta fever (4) Chronic lymphocytic leukæmia The lymphocytes usually constitute from 90 to 99 per cent of the total count (5) Certain aleukæmic lymphadenoses. (6) *Mycosis fungoides with leukæmic blood changes* (7) Certain disorders of the ductless glands (8) Certain neoplasms particularly in connection with growths of lymphatic tissues as lymphosarcoma where as much as 90 per cent. of the total count are lymphocytes (9) Syphilis (10) Typhoid fever (relative only) (11) Tuberculosis (relative only) (12) Rickets (relative only)

Monocytosis This is marked in infectious mononucleosis, tetrachlorethane poisoning, subacute endocarditis, some forms of septicæmia, Hodgkin's disease kala azar, occasionally in typhoid fever, malaria ... afebrile intermissions), during ... and in rapidly advancing t... monocytic leukemia

Polymorphonuclear leucocytosis Leucocytosis due to polymorphonuclear neutrophil increase is usually due to infection by cocci of some variety Non infectious tissue lesions may also cause it

In bacterial infection over 85 per cent of polymorphonuclears points to pus formation, 90 per cent, to very severe infection The resistance is good if the total leucocytes are increased proportionally and poor if they are not increased There should be

15,000 total with 80 per cent polymorphonuclears
20,000 total with 85 „ ,
25,000 total with 90 , „

Pneumococcal infections give very high figures especially in the total counts

Arneth Count Polymorphonuclear leucocytes have a life in the blood stream, of about three weeks When a cell first enters the circulation its nucleus has only one lobe, but the nucleus gradually becomes more segmented, developing five lobes in the oldest cells In health the proportion of cells respectively with 1 2, 4-, and 5 lobed nuclei is fairly constant, a variation occurs in microbic infections when more young cells (1 to 2 lobes) are seen

Arneth Index Arneth divided the polymorphonuclears under 5 classes according to the number of nuclei or nuclear fragments

A polymorph with one nucleus belong to class I
A , two nuclei , „ „ II
A „ , three „ , , „ III
A „ „ four „ , , „ IV
A „ , five or more nuclei belongs to class V

The sum total of classes I and II is the Arneth index

The following are the normal figures —

Class	I	II	III	IV	V	Index
	5	35	41	17	2	40

If the index is more than 40 the picture is said to be a 'drift or shift to the left, if less than 40, "shift to the right" A shift to the left takes place in most of the infections A shift to the right takes place in leprosy, syphilis, etc.

LEUCOPENIA In disease a count bel... and it occurs in the following conditions (1) I... fevers and briefly after typhoid vaccinati... kala azar measles and rubella small pox (up to fourth day), dengue pappataci fever and overwhelming infections (2) Intoxications, *e g*, benzol, arsenic,

antimony, lead, irradiation with Roentgen ray and radium, early stage of reaction to parenteral foreign protein, inanition (3) Diseases of the hæmopoietic system, *e g*, aplastic Addisonian anæmia, Banti's disease, primary leucopenia (agranulocytic angina), Gaucher's disease and the aleukæmic stage of leukæmia

Red Blood Cells.

Total number	5,000 000 to 6 000,000
Hæmoglobin percentage	80 to 100
Colour index	0 75 to 1 0

Normal variations of number of red cells in a cubic millimeter of blood (Normocythemia)

At birth Average, 5,000 000 Total range, 5 000 000 to 7,000,000

From one month to sixteen years Average, 4 500,000 Total range 4,000,0000 to 6,000,000

Adult males aged nineteen to thirty years Average 4 800 000 per cent., of men 4,700,000 to 6,100 000 Total range of men 4 200 000 to 6 400,000

Adult females aged nineteen to thirty years Average, 4,800 000 90 per cent of females 4 300,000 to 5,300,000 Total of females, 4 070 000 to 5,550,000

RED CELL COUNT Capillary blood from the fingers is used as in a white cell count The blood is sucked into the pipette up to the mark 0 5 and is diluted with Hayem s R B C fluid (mercury bichloride 5 gr, sodium chloride 9 gr, *Red cell*
sodium sulphate 46 gr and d st lled
101 The pipette containin
drop on the counting chamb
as in the white cell count
the ruled lines on the coun
including 16 small squares) should be counted To obtain a total red cell count per cubic millimeter add four zeroes to the total cells counted This is the number of cells per cubic millimeter

1 *Hypochromia* (Anchromia) is the main change in hæmorrhagic or chlorotic anæmia Red cells show less colour in the centre

2 *Poikilocytosis* occurs in any moderate or severe anæmia

3 *Anisocytosis* is mos
pernicious type and less so
chromic microcytic anæmias
very marked The Price Jo
this observation The halometric method is a valuable substitute

4 *Nucleated red cells* occur in anæmias where the immature cells are called out The very severe chronic anæmias like pernicious may call out the very primitive megaloblast

5 *Basophilic stippling* with a red cell count from 3 to 5 million is suggestive of lead poisoning, although it is not present in all cases

6 *Polychromatophilia* is found in any severe anæmia

HÆMOGLOBIN 1 *Estimation by the paper scale (Tallquist)* A small drop of blood from a finger prick is put on a piece of absorbent paper and the paper is folded so as to blot the drop at once This gives a layer of blood having a uniform thickness Compare the colour immediately with the scale given in the book, using daylight coming from over the shoulder Normal 80 to 100 per cent *Hæmoglo estimation*

The margin of error is 10 to 20 per cent depending on the experience and skill of the examiner *It is not possible to detect any hyper hæmoglobinemia by the paper scale*

2 *By hæmoglobinometer of Sahli* In the Sahli apparatus a standard hæmatin solution is contained in a sealed narrow glass tube By means of a fine pipette 20 c. cm of blood are drawn up from a drop *on the finger tip and* immediately transferred to a small calibrated tube Into this tube has previously been placed a small quantity (up to the mark 10) of 1/10 hydrochloric acid The mixture is allowed to stand for a few minutes until the red hæmoglobin of the blood has been changed by the hydrochloric acid into brown acid hæmatin *Distilled water is added drop by drop until the colour in the open tube is exactly* that of the sealed standard tube With normal blood the two tubes become equal in colour at a dilution of about 100 while in hæmoglobin poor specimens this point [illegible]

3 *By Hellige apparatus* An improvement on the Sahli principle is incorporated in the Hellige apparatus It consists of colour prisms which are accurately standardised with the colour of blood and are absolutely independent *of outward influences The procedure is the same as with the Sahli Hæmometer* After having [illegible]
20 c. cm of [illegible]
The blood [illegible]
added after about one minute and constantly shaken until the mixture matches the colour of the standard prism

Colour index is a term used to express the average hæmoglobin content of the corpuscles of a given *blood It is obtained by dividing the percentage of* hæmoglobin by the percentage of red cells (5 millions per c mm being taken as 100 per cent) Thus a blood with 60 per cent of hæmoglobin and a red count of 2 5 millions (=50 per cent) has a colour index 60/50=1 2 In secondary anæmia the colour index is considerably below 1 in pernicious anæmia it is about 1 or over owing to the presence in the blood of many large red cells

FRAGILITY OF THE RED CORPUSCLES Red cells can remain for hours in isotonic salt solution without damage but in distilled water they are quickly hæmolysed The fragility of red cells is determined as follows A drop of blood is added to a series of tubes, *each containing 1 c cm of different strengths of hypotonic salt* solution varying from 0 25 to 0 7 per cent Each tube is shaken and allowed to stand for two hours at room temperature If no hæmolysis occurs the unchanged corpuscles are found at the bottom of the tube overlaid with colourless solution If hæmolysis takes place, a transparent red solution results Normally *hæmolysis begins at 0 45 per cent and is complete at 0 35 per cent In acholuric* jaundice the corpuscles are excessively fragile, and hæmolysis may begin with as high as 0 7 per cent and be complete at 0 45 per cent In most other anæmias the resistance is increased depending on the severity of the anæmia where hæmolysis may not begin until 0 36 per cent and complete before 0 24 per cent After splenectomy also the resistance of the red cells increases

ABNORMAL RED CELLS The red corpuscles may vary in shape in size, and in their staining reactions They may be distorted in shape—*poikilocytosis*, or be unduly small—from 1μ to 6μ when they are termed *microcytes*, or unduly large 10μ to 18μ when they are termed *macrocytes* Where marked variation in size of

the red corpuscles is present the condition is termed *anisocytosis* Regarding its staining reactions *achromia* is characterised by pallor of the central portion of the stained red cell and in the fresh blood by a vacuolation in the centre of the cell Immature red cells frequently show *polychromatophilia* the stained cells taking on a brownish to a dirty blue tint

Normoblasts or nucleated red corpuscles are of the same diameter as the non nucleated red corpuscles and have large round intensely stained nuclei which nearly fills the cells and the cytoplasm of the normoblast stains pink or not infrequently shows polychromatophilic staining The parent red cell or *megaloblast* and the normoblast appear in the blood films in cases of severe anæmia T
in shape
less intense

Blood platelets These were first detected by Bizzozero in 1882 as the third formed element of the blood They are essential to life and play an important role in the physiology of blood Wright holds that they arise from the giant cells c *Blood Platelets*
40 microns in
from erythrocy
marrow and m
rise to platelets Others hold that these are formed from leukocytes Functionally the thrombocytes are essential to the coagulation of the blood contributing some substance necessary to the process of coagulation

The average diameter of a platelet is from 2 to 4μ (from 1/5th to 1/2 the diameter of a red cell) They stain well with Wright s or Giemsa s stain Their specific gravity is less th
they are pure white in colo
they contain nitrogen ph
For practical purposes a
may be considered as normal for adults and older children The count is however very sensitive and widely varies

They decrease after injections of benzol calcium antimony tissue extract tuberculin corpus luteum extract peptone and bacterial tox ns
die
spl
ph
X rays or radium

They decrease in eclampsia uræmia kala azar malaria (just before rigors) in anaphylactic shock in aplastic anæmia acute lymphocytic leukæmia purpura *Platelets in different d*

oozing from the mucous membranes occurs

The average life of a blood platelet is 3 or 4 days after which it is destroyed by the splenic macrophages and the sinus endothelium of the reticulum The spleen also seems to act as an emergency reservoir for the thrombocytes After splenectomy the reticulo-endothelial system takes over the function of destroying

the platelets Leucocytes are also described to take a part in the phagocytos s of the platelets

Methods for increasing the platelets in thrombocytopenic states are splenectomy blood transfusions injection of foreign protein and other products such as corpus luteum extract repeated injections of adrenaline the use of ultra violet rays living in a high altitude and injection of calcium salts atophan peptone etc

Reticulocytes At birth 30 to 50 per cent of the red cells in the circulation are reticulated but their number drops during the first week to 1 per cent at which it remains through life Their number is increased whenever red cells are being rapidly manufactured

Reticulocyte counting is a means of estimating the rate of red cell production A small drop of fresh blood is mixed with two big drops of cresyl blue solution A drop of diluted blood is transferred to a clean glass slide and covered with a clear cover slip The margin of the cover slip is smeared with paraffin It is then examined under the microscope with an oil immersion lens The number of reticulocytes among 1 000 red cells is counted and then the percentage is calculated

(1) AGGLUTINATION REACTIONS After inoculation or infection substances which ag ... nd in the blood serum ... a high dilution of the se ... that organism A standard serum containing agglutinating powers for only one type of organism may be used to identify that organism

(2) BLEEDING TIME. Duke s method Make a deep prick in the lobe of the ear and at intervals of 30 seconds take up the drops as they exude with a piece of filter paper care being exercised to avoid touching the skin Note the time elapsed when clotting occurs Normally the continuance of bleeding is not more than two or three minutes A prolonged bleeding time indicates capillary wall defect due to toxins or lack of nutrition The bleeding time is greatly increased in thrombocytopænia and in chloroform and phosphorus poisoning In hæmophilia the bleeding time is usually not prolonged

(3) COAGULATION TIME. There are two methods —(1) By Wright's coagulometer This consists of several fine capillary tubes into which blood is drawn at definite intervals and at varying intervals they are blown out When the blood cannot be blown out it has coagulated Note the time in each case The difference of the time indicates the actual coagulation time of the sample of blood (2) By a long fine capillary tube into which the blood is drawn and the time noted A little part of the tube is broken at intervals until a fine thread like substance is produced in the broken part (fibrin thread) The time of appearance *of the thread is the coagulation time The average time is about* 3 to 4 minutes Age and sex do not influence the rate
Coagulation time is increased in hæmophilia kala azar certain cases of pernicious anæmia jaundice splenic anæmia leukæmias urticaria etc

(4) COMPATIBILITY TEST A sample of the patient s blood is mixed with an equal quantity of sodium citrate and to this is added one fifth of its volume *of similarly treated blood from the donor* The proportion of the respective bloods is the same as that in the patient after a large transfusion The addition of the citrate makes any clumping more apparent A transfusion should never be given if the donor s and patient s blood are incompatible by this test (For details see page)

(5) PEROXIDASE REACTION This is done in order to differentiate leucocytes of marrow origin from those of lymphatic origin The granules in the leucocytes of marrow origin take a deep blue stain Granules of polymorphanuclears and eosinophiles, myelocytes and myeloblasts are stained intense blue The large mononuclears and transitionals show few black granules

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Icterus Inde

Techniques for collecting blood Venepuncture The median basilic vein at the elbow is one choice in venepuncture in general practice for collecting blood Absolute asepsis of the overlying skin is of extreme importance in the procedure This is generally effected with absolute alcohol or with tincture of iodine It is always well to ask the patient to lie down to avoid the risk of fainting, particularly
niquet above
Immersion
fat subjects
the vein is generally palpated before introducing the needle A clean sterile and dry record syringe is generally used to withdraw blood from the vein As soon as the blood is withdrawn the needle may be taken off from the nozzle of the syringe and the blood transferred to the tube This procedure best applies to adult patients but infants' blood is usually withdrawn from the external jugular vein or the longitudinal sinus (anterior fontanelle) Sometimes capillary blood, in infants, is also used for the purpose

Techniques of Blood collect

Blood from the external jugular vein A clean sterile and dry glass syringe with a needle 1 to 1½ inches in length is generally used The child should be wrapped up in a small sheet One person should hold the shoulders and the body and another should fix the head, hanging over the edge of a table and turned to one side After [illegible]
into the vein
angle of 20 de
underlying vital structures during such procedure The blood is then transferred to a tube as before

Blood from the longitudinal sinus In infants with fat necks the longitudinal sinus may be used for withdrawal of blood as the anterior fontanelle remains usually open up to the age of eighteen months With the same aseptic precautions as were adopted for puncture of the external jugular vein and the head being shaved beforehand and held in position by a nurse the needle of the syringe is inserted at the posterior angle of the fontanelle making an angle of 20 degrees to the skin surface and not more than 1/8 inch deep Puncturing brain substance though not common, should always be avoided

Collection of capillary blood The blood is collected from the lobule of the ear or the finger The part should not be cold œdematous or congested With proper aseptic precautions, an incision or a stab wound is generally made with

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Collection of capillary blood The blood is collected from the lobule of the ear or the finger The part should not be cold œdematous or congested With proper aseptic precautions an incision or a stab wound is generally made with

a sterile fine pointed lancet on the back of the second or the third finger, a little behind the nail bed The depth of the wound should not exceed more than 2 mm The finger is grasped well and is flexed Blood wells up in drops When the lobule of the ear is used its lower border should be used for incision

Collection of arterial blood A puncture is generally made where the artery runs a superficial course Blood is withdrawn from the brachial, the radial or the femoral artery The overlying skin is thoroughly sterilised and the part is anæsthetised with a local anæsthetic like 2 per cent novocaine The needle of the syringe is inserted at an angle of 45 to 60 degrees directing it towards the arterial pulsation and the syringe fills without suction No untoward results follow such a procedure After withdrawal of the needle the punctured spot should in all cases be evenly pressed with firm pressure for some time, to avoid the formation of a local hæmatoma

Collection of specimens No special preparation is usually necessary except that the blood should be drawn in the morning before the patient has any food, it is essential however that the specimen is properly labelled and sent to the laboratory immediately after collection

The following table gives an idea of the approximate quantity of blood required and the method of collection

Estimation of or Examination for	Quantity of Blood in c cm	To be collected in
Sugar	2	Oxalated tube
Urea	2	
Non protein nitrogen	5	
Cholesterol	3	
Calcium	3	Sterile test tube
Van den Bergh's test	5	
Aldehyde test	2	
Antimony test	2	
Widal reaction	2	
W R	3	Clean phial or test tube
Culture	5	Broth tube
Grouping	5	2 c cm in citrate tube 3 c cm in test tube

PARASITES OF THE BLOOD 1 *Malarial plasmodia* Three common species (in man)—(*a*) Plasmodium vivax (tertian parasite) (*b*) Plasmodium malariæ (quartan parasite) (*c*) Plasmodium falciparum (æstivo autumnal parasite)

Methods of examination of the blood The blood may be examined for malarial parasites (*a*) in wet preparation (*b*) in stained smears For identification of different parasites *vide* text

Provocative methods for increasing the number of plasmodia in the circulating blood in patients where blood contains small numbers of parasites have been advocated After a subcutaneous injection of 1 c cm of adrenalin, the parasites appear in the peripheral blood in about 20 minutes and the maximum number is obtained in about an hour after such injection Ergotine, strychnine application of ice ultraviolet rays or X rays over the splenic region have also been advocated

of sites

Ross thick blood film method and methods for culture of plasmodia *in vitro* (Bass and Johns)—*vide* text

2 *Filaria* The embryonal or microfilarial form enters the peripheral blood stream and the examination of such blood is undertaken for diagnostic purposes

Examination of the blood for microfilaria A small drop of blood is generally placed on a clean glass slide, the surrounding part is smeared with vaseline to prevent rapid drying and the whole is covered by a clean glass slide

A better method of detecting the parasites in the blood is to add about 0 5 c cm of blood to about 9 c cm of 2 per cent acetic acid After thorough mixing th rom the sediment ht when the peripl a little the red ce

3 *Trichina* The embryos of *Trichinella spiralis* may be found in the blood in trichinias s At birth an embryo measures 0 1 mm and grows to about 1 mm when it becomes encysted in the muscle

4 *The blood flagellates* Two groups (A) Trypanosoma (a) *Trypanosoma gambiense*—African sleeping sickness (b) *Trypanosoma rhodesiense*—Rhodesian (African) sleeping sickness (c) *Trypanosoma cruzi*—Chagas disease

Trypanosoma Trypanosoma gambiense Length from 15 to 30 microns As they occur sparsely in the blood a method of concentrating them is necessary

Met' *Trypanoso*

of 6 per

the final

detecting the parasites than simply wet blood preparations Auto-agglutination of the red cells should be looked for as this is frequent in infection with *trypanosoma gambiense* and *rhodesiense* The other type presents similar diagnostic features

(B) *Leishmania* (a) *Leishmania donovani*—Kala azar (b) *Leishmania tropica*—Oriental sore (c) *Leishmania braziliensis*—American leishmaniasis

Leishmania donovani In blood the L D body is seen as a small rounded or oval body, 2 to 4μ in diameter, within the monocyte or neutrophil The scarcity of the parasites in the peripheral blood has led to methods for increasing their number One c cm of adrenalin is injected subcutaneously or 0 1 to 0 2 gm of an organic antimonial intravenously This produces a splanchnic contraction with the squeezing out of the parasites from the splenic pulp into the peripheral blood The parasites may also be demonstrated by examination of the material from splenic puncture and culture from the blood *Leishmani*

Leishmania tropica Successful diagnosis depends on the detection of the parasites by examining material from the lesion of the skin

5 *Spirochætes of the blood* Direct examination of the blood is necessary in (a) relapsing fever (b) infectious jaundice to detect the particular parasites There are two methods for staining films for spirochætes (1) Giemsa s rapid method (2) Fontana s method

Relapsing fever (*Treponema recurrentis*) Length of the parasites 10μ to 20μ Generally found in the blood during fever The thick drop method is of advantage when parasites are scanty in the blood The parasites unlike *T pallida* stain easily with Wright s stain

Infectious jaundice (*Leptospira icterohemorrhagica*) Length 5 to 25μ Direct examination of the blood is necessary to detect the parasites The parasites are found in numbers in the peripheral blood towards the end of the second week

BACTERIOLOGICAL EXAMINATION OF BLOOD It is often necessary to make a bacteriological examination of blood and it is a safe and sound rule that when a patient has *continuous fever three days or more and the course of such fever is unknown a blood culture should be undertaken* (In health the blood is sterile

and the recovery of organisms from it during life is of pathological significance) Bacteria may be found in patients supposed to be suffering from septicæmia or pyæmia (1 spread from a septic focus—streptococci, staphylococci, anthrax 2 general infections—typhoid, plague, meningococcal infections, pneumonia undulant fever and 3 infective endocarditis)

In the Enteric group of fevers blood culture offers the most definite means of diagnosis but it must be carried out early in the disease (it is also positive in relapse) To do a blood culture properly the following method is recommended

Apparatus, etc 1 Sterile syringe and needle (a well made 10 c c syringe with a sharp pointed moderately stout needle)

2 Culture media (One or more of the following in flasks containing 50 to 100 c c) (*a*) Peptone water with ½ per cent sodium taurocholate (*b*) Nutrient broth with ½ per cent sodium taurocholate (*c*) Sterile ox bile (*d*) Sodium taurocholate ½ per cent in distilled water (This or even distilled water alone may be used in an emergency where other media are not available Note that the laked blood serves as a nutrient medium (*e*) One per cent glucose broth (*f*) When a
minced meat broth)
cases suspected of *B*

3 Tourniquet

4 Sterile swab

The actual technique Sterilise the syringe with the needle This is best done by drawing up
The syringe can be
plugged with cotton
cannot destroy spores) but if the syringe is kept scrupulously clean boiling for 15 minutes will suffice After taking all necessary precautions, 10 c cm of blood should be withdrawn Inoculate the appropriate medium Remember to protect the mouth of the flask from contamination and to flame the mouth Collect the last c cm or so of blood in a sterile tube for agglutination test

Incubate at 37°C for 24 hours and examine flask for growth When it is necessary to perform blood culture at a distance from a laboratory and to transmit the specimen by post the most convenient method is to forward the blood in sterile 25 c cm vaccine bottles provided with rubber caps The blood can be introduced directly through the rubber cap into the bile The needle puncture sealed and the whole wrapped and sent to the laboratory

8 Blood Pressure

By blood pressure is meant the pressure that the blood exerts against the wall of the vessel in which it is contained The term therefore includes endocardial pressure arterial pressure venous pressure and capillary pressure But clinically blood pressure usually refers to the tension of the arteries only and depends on the following factors —(*a*) The force of contraction of the left ventricle (*b*) The volume of blood which the left ventricle propels into the already full arteries (*c*) The elasticity of the middle coat of the large arteries (*d*) Lastly the peripheral resistance or the resistance to the outflow offered by

The activities of the vagus and the vasomotor centres are regulated by reflexes from the carotid sinus Any rise of pressure in the sinus causes slowing of the

heart and dilatation of the arterioles whilst a fall of pressure produces the opposite change The arterial pressure of the body at rest may be said to be the lowest pressure at which the brain can obtain an adequate blood flow The blood supply to different organs and tissues of the body depends on the efficient working of the heart and the maintenance of a certain amount of tone in the arterioles supplying blood to them The arterioles are richly supplied with vaso-constrictor nerves and always maintain a certain amount of tone, which is constantly regulated by the vasomotor centre in the medulla through the vasoconstrictor nerves When there is a general rise o pressure, the action of the vasomotor centre is re inforced by the suprarenal glands which produce an increased output of adrenalin thus causing a further constriction of the vessels and adding to the already existing increased blood pressure The arteries and arterioles are relatively thick walled vessels and the blood in them is under considerable pressure and moves with a fair velocity The blood in the aorta is at a pressure of about 120 mm Hg and moves with a velocity between 100 and 200 mm per second during systole The velocity and the pressure decrease as the vessels branch and become smaller but both remain considerable as far as the arterioles The arterioles open into the capillaries where the pressure is only 10 mm Hg and the velocity of the blood is about 1 mm per second

Essential hypertension may be described as a persistently raised systolic and diastolic blood pressure not due to arterio capillary, renal cerebral or other recognizable morbid change It may, however, cause and be the antecedent stage of cardiovascular changes, renal fibrosis and other pathological conditions The hypertensive impulse however caused emanates from the controlling vasomotor centre in the medulla Vasomotor instability is present in many cases of hypertension It is conceivable that a metabolic poison selectively constricts the arterioles of the vasomotor centre and the resulting ischæmia stimulates pressor impulses Clin cal observation shows that arteriosclerosis and high blood pressure, though often associated, occur independently and that long continued hypertension is more responsible for degenerative arterial changes than *vice versa* *Essential hypertension*

ÆTIOLOGY *Predisposing factors* Heredity has been rightly considered to be a predisposing factor Males suffer more than females due to stress and strain of life *Exciting causes* These are sedentary habits and factors leading to intestinal toxæmia, toxic blood states renal disease, metabolic diseases like gout and diabetes, psychical causes such as worry, anxiety and prolonged mental strain, plethora, cardiac hypertrophy, neuro vascular diseases like Raynaud's disease and certain endocrine disorders such as excessive secretion of adrenalin or vasopressin It has been suggested that hypertension is due to overactivity of the chromaffin system and hyperplasia of the adrenal medulla, though adrenalin has not been found in excess in the blood of hypertensive subjects MacWilliam holds that defic ency of hypotensive bodies in the circulation is a possible cause of hypertension *Etiology*

Clinically there may be no symptoms and the discovery of high blood pressure may be purely accidental Subjective symptoms experienced by the hypertensive subject may be headache, cardiac symptoms such as præcordial pain and palpitations nocturnal frequency of urine dizziness nervousness fatigue, symptoms of cerebral vascular lesions ocular symptoms, epistaxis and hæmoptysis

Methods for determining blood pressure William Russell (1921) states that the finger is still the main means of estimating blood pressure in clinical work It is quite impossible to determine, even approximately, the diastolic pressure without instrumental aid It is important to investigate it for several reasons The diastolic pressure may be raised without corresponding increase in the systolic

pressure This involves a *continuous* increased strain on the vessels The prognosis with a constant diastolic pressure of 135 mm Hg or over is very grave The diastolic pressure may be abnormally low, although the systolic is raised this *is found* typically in aortic regurgitation with a free reflux It is necessary to determine the diastolic pressure in order to calculate the pulse pressure An increased pulse pressure is associated with hyperthyroidism Another example of the value of instruments in taking blood pressure is that the condition of pulsus alternans may sometimes be diagnosed by this means although it is not perceptible to the finger alone

The normal pressure varies at different ages and it may be taken that the average systolic reading for an adult is 100 plus half the age in years and that *in any case a systolic pressure above 150 mm of Hg* is abnormal The diastolic pressure is approximately two thirds that of the systolic up to middle age but

[illegible]

ing a blood pressure below average as the normal If individuals can perform their daily work with a blood pressure below average they are fortunate as there *is less wear and tear upon their tissues especially their blood vessels and the heart*

The following may be regarded as the normal standard of systolic blood pressure as measured in the brachial artery while at rest In children under *10 100* mm in early manhood from *100* to *120* mm in middle age from *125* to 135 mm above 60 years of age 145 to 150 mm In the female the systolic pressure is generally 10 to 20 mm lower than in the male The range of diastolic blood pressure as estimated by the auscultatory method in healthy young adults is usually accepted as 70 to 90 mm

There are variations in the blood pressure under physiological conditions among these being mental states sensory stimulation sleep change of posture meals and physical exertion Those of nervous and anxious temperament as well as those whose mode of life necessitates considerable nervous strain have a tendency to exhibit higher readings especially in the later period of life while in those of an equable and placid temperament and those whose mode of life *is smooth the opposite is the case Sensory stimulation often* causes a rise in the arterial pressure especially in the diastolic In sleep there is a fall of blood pressure Opinions vary as to the effects of the digestion It is probable that the change in pressure commences *within a quarter of an hour after a meal* the highest reading being reached in about an hour after which it gradually returns to the normal During exercise the pressure as well as the pulse rate are raised returning to normal in half an hour

The systolic blood pressure shows the greatest variations It is usually affected first Persistent readings of more than 10 mm above the average are not normal When hypertension has existed for some time there is enlargement of the heart The diastolic blood pressure is more stable and small variations are significant It is however more difficult to estimate When over 90 mm it is suspicious over 95 it is abnormal 100 and over is definitely pathological *110* and over usually means progressive kidney disease or malignant hypertension (Keith) If diastolic pressure is high it means excessive constant strain on the circulation and if it is abnormally low it means a serious handicap because of poor myocardial nutrition Pulse pressure is a composite of both the systolic and

the diastolic A dropping pulse pressure usually means myocardial failure Pressure variations from beat to beat may occur with premature beats and in *auricular fibrillation When during normal rhythm* regular variation occurs in alternate beats one can diagnose pulsus alternans This is one of the most important signs of cardio vascular failure and is indicated by the sphygmomanometer

Blood pressure both high and low appears to be a familial trait and has been regarded by some as associated with special constitutions The characteristic *of low blood pressure subjects is a long narrow chest, they are* easily affected by cold easily tired and of hyposthenic habits The high blood pressure subjects are broad shouldered broad chested athletic and are of hypersthenic habits Constitutional low blood pressure shows no tendency to become progressively lower but so called constitutional high blood pressure is liable to become permanently higher

Hypertension may be divided clinically into three groups according to the order of appearance and seriousness (I) Both systolic and diastolic pressures are raised with a pulse pressure above normal Here we have pathological changes in the vascular system especially the arteries (II) The diastolic pressure is normal or nearly so but the systolic is raised and the pulse pressure correspondingly high This is the so called stage of essential hypertension' or hyperpiesia (III) *The diastolic pressure is high but the systolic is dropping giving* a low pulse pressure This is the stage of myocardial failure and may be present for some time without symptoms

Hypertension

TREATMENT As normal blood pressure has a wide range of variation in

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a case Foci of chronic sepsis which may be associated with the teeth tonsils nasal sinuses gall bladder prostate etc should be searched for and eradicated where pos
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by the patient of an equable cheerful and balanced temperament is important Occupations of steady routine are to be preferred to those that involve constant

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exertion hurry worry and straining at stool should always be avoided When *symptoms of hypertension develop physical rest in bed is imperative* and the pressure consequently falls Myocardial failure also demands absolute rest

Diet therapy Diet should be simple wholesome and small in amount A tendency to obesity be controlled and carbohydrate should be restricted if such a tendency exists Excess of carbohydrates and fat causes flatulent dyspepsia which in turn increases the blood pressure A high protein diet should never be encouraged as the products arising out of putrefaction of proteins in the intestine are potent causal factors in hypertension On the other hand a low protein intake

Diet thera

should be aimed at Fresh fruits vegetables cereals and fish may from part of the dietary Eggs milk and similar products rich in cholesterol should be cut down to the minimum Drinks like alcohol tea and coffe should never be *freely indulged* in A moderate indulgence in tobacco is probably not harmful while its soothing effects may even be beneficial Excessive smoking should be forbidden Ingestion of excessive quantities of *fluids is distinctly* harmful in hypertensive subjects and it is suggested that one pint of fluid for every five stone of body weight taken in during the twenty four hours should be the usual rule Opinions vary regarding the intake of chlorides Patients *with high* blood pressure but presenting no symptoms may be allowed common salt is ordinarily used in the preparation of food but a strict saltfree diet is desirable in cases where symptoms like palpitation dyspnœa and œdema have supervened

Physiotherapy Exercises preferably in the open air and only in moderation may be allowed to hypertensive subjects provided no symptoms of cardiac decompensation appear Deep breathing exercises passive movements general massage are all useful therapeutic adjuncts in lowering high arterial pressure As regards baths the value of hot baths is doubtful and cold baths are harmful because they raise the blood pressure, tepid baths (94° to 98°F) are beneficial A yearly visit to a spa may be a valuable aid to ordinary treatment

Drug therapy Drugs though of secondary importance have their place in treatment more especially in the earlier stages Later they are needed to relieve distressing symptoms of cardiac cerebral and renal origin No specific drug is known to cure the disease or to alleviate symptoms permanently A large number of synthetic drugs have been tried but not one is known to have any specific effect in the disease Treatment with drugs is therefore only symptomatic and emergent and this should go hand in hand with diet and physiotherapy As constipation and intestinal toxæmia play an important ætiological role in hypertension purgatives occupy the foremost position in treatment The daily use of purgatives is obnoxious and it should be noted that slight laxative action of the bowels daily is of greater use than the use of an occasional purge It is suggested that abdominal massage and bulky carbohydrate foods might help in complete and regular evacuation of the bowels but this does not suit fat persons who are usually the victims of the condition and are often subjects of flatulent dyspepsia Carbohydrates increase blood pressure and sometimes give rise to colic and mucous colitis For regular use liquid paraffin (1 to 2 oz) and allied

intervals or when subjective symptoms appear In some individuals a daily dose of saline sufficient to give one or two loose stools keeps the blood pressure down When actual symptoms of hypertension such as fullness in the head headache palpitation etc develop time should not be lost in procuring and maintaining adequate rest and administering depletive remedies such as cholagogue purgatives and the hydragogue cathartics to the patient In toxæmia resulting from intestinal stasis rectal injections every morning for three weeks of a pint of solution of potassium permanganate (1 gr to 1 pint of water) is often of great value Along with such treatment a simple diuretic mixture with bromides and valerian when the patient is nervous by disposition is often of much benefit Sedative drugs are of much benefit in these cases and bromides chloral hydrate and barbiturates are often prescribed with advantage One to three tablets of theominal a combina

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For hypertension of menopause in elderly women bromides with calcium therapy and a polyglandular extract or an extract of ovary appear to be distinctly valuable In nervous excitable and emotional subjects the use sodium amytal in 3 gr doses or phenobarbitone $\frac{1}{2}$ gr is very useful Iodides are thought to lower blood pressure by diminishing the viscosity of the blood and also in very minute doses they act as vasodilators Opinions vary as to the efficacy of iodine preparations in the treatment of hypertension Potassium iodide in increasing doses has been found of much benefit in persons who have passed middle life others prefer colloidal iodine The vasodilators and the hypotensive drugs play an important role in the treatment of hypertension They are most needed in cases of emergency and though the effects are transient the use of such drugs is universal They relieve the heart and blood vessels of excessive stresses administer rest to the myocardium and are powerful palliatives These drugs should however be cautiously prescribed as their indiscriminate use migh precipitate an apoplectic seizure sometimes Of the hypotensive drugs nitrites preparations of sulphocyanic acid choline derivatives veratrum and extracts of certain organs and muscles deserve special mention Nitrites are of particular value in relieving symptoms of headache dizz ness and anginal pains The effects are transient and are of little value in long standing cases of hyper tension Benzyl benzoate has also been extensively used but this is of disputed value Good results have been obtained from long continued use of bismuth subnitrate in the pretensive stage of the disease It is decomposed in the bowel producing nitrate ions which are in their turn converted into nitrous acid by *Bact coli* and this maintains continued vaso-relaxation It is given three times a day in capsules containing 10 gr of the drug for several months Sodium sulphocyanate is of particular value where organic changes in the arteries are absent It is prescribed in $1\frac{1}{2}$ gr doses three times daily after meals for the first week twice daily for the second week and once daily for the third week. The drug should be discontinued if a rash appears and it should never be prescribed if the renal functions are impaired (Elixir sodium sulphocyanate contains sodium sulphocyanate 20 gr to an ounce) The choline derivatives act as a specific stimulant of the parasympathetic system and antagonise the action of adrenals A few of its derivatives are efficient vasodilators of which pacyl (choline content $1\frac{1}{2}$ gr) acetyl choline and hypotan deserve a mention Pacyl and hypotan (methyl acetyl choline bromide) tablets are sold for oral use The dose of each is 3 to 6 tablets daily Acetyl choline has a more prolonged action than pacyl or hypotan It is given as a subcutaneous or an intramuscular injection and [illegible]

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A few words are necessary on the treatment of low blood pressure The common ætiological factors responsible for hypotension include acute cardiac diseases chronic valvular diseases of the heart especially the mitral chronic interstitial myocarditis myocardial degeneration endocrine dysfunctions particularly Addison's disease and early stages of Grave s disease chronic wasting maladies such as tuberculosis, infectious diseases such as enteric fevers diptheria pneumonia autointoxication from septic tonsils, teeth, colon genito urinary tract etc Considerable loss of fluid from the body results in marked low blood pressure in cases of cholera acute diarrhœa dysentery, vomiting and severe hæmorrhage. The condition is brought about by a diminution of ventricular output lowering of the vasomotor tone due to derangement of the vasomotor centre and splanchnic stasis The cases frequently show symptoms of asthenia, myasthenia giddiness faintness mental depression nervous instability sensitiveness to cold etc The treatment of hypotension is essentially a treatment of the primary cause Eradication of the septic foci in the body when detected is most important Diet should be a mixed one and may be rich in protein content Meat extracts meat soups eggs and milk should be supplied to the dietary in sufficient quantities Fluid intake should always be encouraged In cases where loss of body fluid is marked sufficient fluid should be supplied to compensate the condition Massage is useful in some cases Wearing of an abdominal belt is a helpful measure in cases of splanchnic stasis A few drugs are of reputed value in raising blood pressure in hypotension of which adrenalin ephedrine pituitary extract and strychnine deserve mention Strychnine and calcium are very much favoured as drugs of efficacy in acute infectious fevers such as diptheria pneumonia etc where low blood pressure is frequently marked Saline infusions injections of adrenalin pituitary extract or ephedrine are invaluable in raising the blood pressure in *cases of hæmorrhage acute diarrhœa cholera* et In cardiac diseases digitalis and strophanthus are of proved value A change of climate and tonics such as iron arsenic and glycerophosphates are most *beneficial in the treatment of prolonged convalescence after acute diseases where* the blood pressure is generally low

TECHNIQUE *The Brachial Blood Pressure* The readings should be taken with the patient at physical and mental rest Tight clothing is removed from the arm which is placed at the same level as the heart The pneumatic cuff is then emptied of air and wrapped firmly round the upper arm The radial pulse is palpated the valve closed and the pressure in the cuff raised rapidly in steps of 10 mm of mercury The level at which the radial pulse can no longer be felt is the systolic pressure by palpation method The cuff is then deflated by unscrewing the valve

The systolic and diastolic pressures are then measured by auscultation The brachial artery is palpated in the antecubital fossa and a stethoscope placed lightly but firmly over the vessel The valve is closed and the pressure in the cuff raised rapidly to 30 mm of mercury above the systolic blood pressure as determined by palpation The pressure is then gradually reduced so that the mercury column falls at a rate of about 3 mm per second The level at which regular clear sounds are heard is taken as the systolic blood pressure If the level by palpation is higher that is taken as the systolic pressure As the pressure falls the sounds take on the character of a murmur and then become progressively louder and more banging suddenly they become dull and muffled and finally disappear The level at which the sounds become dull and muffled is usually taken as the diastolic pressure but direct measurement *of the* intraarterial pressure suggests that the point at which the sounds disappear is nearer the true

diastolic pressure There is however only a slight difference between these two points
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examination particularly when syphilitic aortitis is suspected, a difference of 10 mm mercury in the systolic and 5 mm mercury in the diastolic pressures is within normal limits

The Femoral Blood Pressure If available a pneumatic bag 15 20 cm wide is used because of the greater bulk of muscle in the leg The patient lies prone *and the cuff is wrapped evenly and firmly round the thigh The popliteal artery* is first palpated and then auscultated and the blood pressure determined as in brachial artery With an ordinary cuff the systolic pressure is 35 mm and the diastolic pressure 25 mm of mercury higher in the legs than in the arms

The upper limit of normal blood pressure under forty years of age is 140/85 and over that age 150/90 Blood pressure systolic and diastolic may be raised by exercise, emotion smoking etc A single high reading in an anxious patient does not mean hypertension In such cases repeated readings are necessary

Pulse pressure is the difference between systolic and diastolic pressure the normal range being between 40 70 mm mercury Abnormal increase occurs in aortic regurgitation and other causes of peripheral vasodilatation or to a high systolic pressure Decrease occurs in aortic stenosis Addison's disease, etc

9 Disorders of the Blood

Normal blood values are —

	Normal range	Average
Haemoglobin Men — —	14 0-18 0	15.8 G per 100 ml
Women — —	12 0-15 5	13 7 G per 100 ml
Red Corpuscles Men — —	4 5-6 5	5 5 million per cmm
Women — —	4 0-6 5	4.8 million per cmm
Colour Index — —	0.85 1 15	1 0
Diameter of Red Corpuscles —	6 7 7 7	7 2
Mean Corpuscular Volume (M C V) — —	78-94	86
Packed Cell Volume (P C V) Men — —	38-54	47 ml per 100 ml.
Women — —	36-47	42 ml per 100 ml
Erythrocyte sedimentation rate		
Westergren method Men —	3 5 mm in 1 hour	
Women — —	4 7 mm in 1 hour	
Wintrobe method Men —	0-9 mm in 1 hour	
Women — —	0-20 mm in 1 hour	
Reticulocytes — —	Less than 2 %	
Platelets — —	200000-500000 per cmm.	
Bleeding time Ivy's method —	1 4 minutes	
Duke's method — —	2 5 minutes	
Coagulation time		
Lee and White's method —	5 10 minutes	
Capillary tube method —	2 4 minutes	

injection of Rh positive blood and (3) the carrying of an Rh positive foetus by an Rh negative mother Transfusion of Rh positive blood to a recipient who has developed Rh antibodies may result in a severe or fatal reaction R
requir

Before giving transfusion
ways be carried out by an
When this is not possible direct matching may be done Take one drop of donor s blood in 1 c cm of saline in a test tube Take one drop of recipient s blood in 1 c cm of saline Take one drop of each on a slide and mix by racking If agglutination is going to appear it will do so in a few minures but the mixture should be left to stand for not less than fifteen minutes and not more than twenty minutes Incompatibility is some times manifested by prompt haemolysis of donors cells which may be overlooked by the inexperienced

INDICATIONS FOR BLOOD TRANSFUSION *Acute Haemorrhage* When more than two pints of blood is rapidly lost symptoms of oligaemic shock such as pallor tachycardia and fall of blood pressure results To cope with these symptoms transfusion of blood is given as a prophylactic measure during a surgical operation when a loss of large quantities of blood is anticipated Blood transfusion is also given when severe hæmorrhage from any cause results The volume transfused should approximate to the amount lost and this generally can be assessed if the hæmorrhage has been external If the hæmorrhag has been internal the volume must be judged from the clinical state of the patient Following a severe hæmorrhage the patient is pale the pulse rapid and of poor volume the skin may be cold and clammy and there may be vomiting The

rapid transfusion is required and a pint should be given every five to ten minutes until the blood pressure has risen to 100 mm of mercury The rate is then gradually slowed to 40 60 drops per minute until the systolic pressure is 110-120mm In less severe cases the blood pressure should be recorded every ten to fifteen minutes if it falls or remains below 100mm for one hour blood should be given Blood transfusion is not indicated unless the hæmarrhage is massive and has produced a severe collapse

Hæmorrhage is not always associated with fall of blood pressure A patient who has obviously lost much blood or suffered a severe injury should be given transfusion of blood even if the blood pressure is within normal limits *Hæmorrhage is not the only cause of low blood pressure and must not be confused* with the collapse following such conditions as a myocardial infarct an acute cerebro vascular accident trauma to the central nervous system or a simple vaso vagal attack associated with slight loss of blood

During acute hæmorrhage estimation of hæmoglobin is not a reliable index of the quantity of blood lost and of the need for transfusion

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or plasma may be given

In hæmoptysis and hæmatemesis transfusion is necessary if blood pressure is below 90 mm, Hb level below 40% and pulse rate of over 120 per minute If

transfusion is given slowly (30-40 drops per minute), there is no danger of blood pressure rising suddenly and restarting bleeding Transfusion of blood should also be given if hæmorrhage has occured a few days before and the patient is anæmic and Hb under 40%

Blood transfusion is also indicated in chronic anæmias when such hæmatinics as, Iron Liver preparations and vitamin B^{12} are not effective Also in anæmia associated with infective conditions, in hæmolytic or aplastic anæmia or preparatory to a surgical operation In these cases sometime concentrated red cells (packed cells) suspended in minimal amount of plasma are given Transfusion in cases of severe anæmia should be limited to one pint or less at a time, to prevent strain in a weakened heart During transfusion pulse and respiration should be recorded every fifteen minutes, if the neck veins become engorged pulse is slow and dyspnoea is present it should be stopped To derive full benefit preoperative transfusion should be given in the week preceeding the operation Transfusion is also indicated in hæmorrhage conditions such as purpura, hæmophilia etc to make good blood loss and also to provide essential clotting factors

Transfusion of blood is also useful in case of protein deficiency in surgical conditions prolonged fevers chronic wasting diseases, etc, when patient cannot take sufficient protein by mouth It is also given in advanced malignant disease to prolong life

SELECTION OF DONORS Donors are selected from healthy persons between the ages of eighteen and sixty five who have good physique and have not suffered from any of the following diseases syphilis malaria, hay fever asthma urticaria cancer goitre diabetes mellitus, heart disease anæmia tuberculosis epilepsy or *Donors*

Technique The donor should lie down with the arm extended and bared to above the elbow A sphygmomanometer cuff is wrapped round the upper arm and inflated to a pressure of 60 90 mm of mercury to impede the venous return and make the veins prominent The skin over the antecubital fossa is cleaned with tincture of iodine or spirit and a sterile towel draped round the arm Using a 2 ml syringe and hypodermic needle a wheal of procaine is raised in the skin over a suitable vein

The needle of the blood taking set is held almost parallel to the surface of

The entry of the needle in guided by careful palpation of the vein immediately proximal to the site of venepuncture The operation is facilitated by requesting the donor to clench his fis[illegible]
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to the 540 c cm mark, the rubber tube through which the blood is flowing is clipped off near its attachment to the bottle, and the sphygmomanometer cuff deflated The needle is withdrawn from the vein and disconnected from the rubber tubing The tubing is now lowered below the neck of the bottle the clip opened and the blood wh[illegible] tube The test tube is sealed [illegible] donor blood is obtained for [illegible] and for excluding syphilis

The puncture wound is covered and the patient should remain lying down for 15 to 20 minutes when he is given tea or coffee to drink Most people feel no discomfort but occasionally there may be dizziness or fainting If this occurs patient should keep lying down till he recovers Not more than one pint should be removed from an average person and half a pint if the weight is below eight stones The bottle is sealed with donor s name blood group date etc

Storage of Blood Blood should be kept at a temperature of 4-6°C As blood is a good medium for growth of bacteria contamination should be strictly avoided If contamination has occured there is free hæmoglobin in the plasma layer above *the settled corpuscles at the bottom In all advanced countries Blood Banks have* been established whree blood from donors are stored in proper refrigerators ready for patients who need transfusions Concentrated red cells may be specially prepared by or taken from the bottom of settled bottles from refrigerators

Blood Transfusion The veins in the anticubital fossa are not always best suited accessible veins in the forearm on the extensor or flexor surface should be preferred Medical Research Council Sets are best for this purpose The needle should be carefully inserted into the vein and blood allowed to flow in at the rate of 5 to 8 drops per minute unless rapid transfusion is indicated as in severe hæmorrhage when 40-50 drops are given Chances of reaction are minimised by slow administration After the transfusion the patient should be watched for half an hour to see if there are any signs of reaction Great care should be taken in warming blood before administration to 38°C or 100°F If it is not warm enough rigors may occur if it is overheated result may be fatal Transfusions are sometime given in sternal bone *marrow or through scalp veins* in infants

Complications A rise of temperature 1 2F may occur during or after the transfusion and sometime there are severe rigors *high temperature from pyrogens* in the solution prepared for the purpose Rigors usually subside in 15 to 20 minutes and if necessary codeine or morphine may be given to allay restlessness

Intramuscular [illegible] may occur if blood has not been properly grouped If this occurs sto[illegible] y occur if transfusion is too rapid or too [illegible] ly or intravenously or digoxin 0 5 to 0 1 [illegible] fat embolism may some time occur Aller[illegible] in 1% of cases

11 Bronchitis

The inflammation of the bronchi is a most common malady induced by various agents bacterial chemical and mechanical It may be acute or chronic affecting both the larger and the smaller tubes The acute and chronic types are further [illegible] to other [illegible] role in the causation of the d[illegible] of age fatigue and privation deformities of the chest chronic cardiac and renal

diseases and conditions of the respiratory passages deserve mention The catarrh-producing organisms responsible for the condition are pneumococcus, Friedlander's penumo bacillus, streptococci, *Micrococcus catarrhalis,* staphylococci, *Micrococcus tetragenus* and sometimes *Bacillus coli communis* *Spirochæta bronchialis* has also been isolated from the sputa of these cases In suppurative bronchitis Pfeiffer's bacillus influenzæ are found in 90 per cent of the cases Secondary bronchitis follows disea
enteric group, small pox
bronchitis are pulmonar
injuries of the chest

Ordinarily three stages are recognised during the course of the disease and these are, an initial dry stage, the second or mucoid stage and the stage of resolution

An acute attack is usually characterised my malaise, aching of the limbs, a sense of oppression about the chest, a moderate rise of temperature varying from 99° to 103°F, hurried respirations, a flushed appearance of the patient The cough is at first dry and hacking and the sputum is scanty and tenacious, later with the onset of expectoration it becomes copious and mucoid in character The temperature usually abates in a week's time The physical signs as revealed by auscultation of the lungs include sonorous or sibilant rhonchi in the early stages and bubbling rales later on

Complications of bronchitis are many of these broncho pneumonia, lobar pneumonia, bronchiectasis, chronic bronchitis and even active tuberculosis deserve mention

TREATMENT The aim of treatment of a case of acute bronchitis should be to maintain the strength of the patient and especially the strength of his heart, to deplete the tubes and relieve cough by promoting free expectoration

In all cases of acute bronchitis the patient should be confined to bed and in cold weather the temperature of the room should be maintained at 65°F During the febrile stage the diet should be summed up in the words hot slops' such as milk, weak tea, gruels, broths and other invalid foods as hot liquids tend to promote bronchial secretion The air of the room may be moistened by means of a steam kettle in the dry stage only Medicated inhalations are useful and vapour of compound tincture of benzoin (1 dr to a pint) is very comforting to the patient in the early stage and later on, a dry inhalation of creosote, terebene

[illegible]

the early stages Dover's powder is highly recommended When very distressing cough is present, compound tincture of camphor may be advantageously added to the mixture To reduce cough at night or in a dry cough linctus is the best for mild cases This may consist of equal parts of compound tincture of camphor, syrup of tolu and honey of squill The usual dose is a drachm Resort may sometimes be made to the use of codeine $\frac{1}{4}$ gr by mouth every 4 hours Cardiac stimulants should be administered where necessary Neither pencillin nor sulphonamides have any effect in this disease, but if pneumonia is present,

go out of doors in inclement weather In fat subjects with bronchitis carbohydrates should be restricted so as to bring down the weight of the patient. In take of alcohol and smoking should be always forbidden Stimulating expectorants are the most suitable drugs

During convalescence a change of climate, nutritious food and a mixture containing strychnine iron, glycerophosphate etc, go a long way to speed up recovery and restore the tone of the patient

Prophylaxis The prevention of attacks lies in the problem of aborting the common cold As suggested by Poulton the introduction of liquid paraffin in excess into the nasal passages will often abort the condition completely Ammoniated quinine flavoured with syrup of ginger or lemon and diluted with water is reputed to abort an attack

12. Burns

These are common accidents in daily life From the standpoint of treatment four stages are recognised (1) shock, (2) acute toxæmia (3) septic toxæmia, (4) healing

Stage of shock This is the first and foremost condition in which there is a general depression of all the vital functions Small burns are those where 10 per cent or less of the body surface is involved Moderate burns are those where 10 to 30 per cent of the body surface is involved Severe and generally fatal cases are those where more than half the body surface is involved The depth of the burn is important

ock

Stage of toxæmia Here there is a rise of temperature increased pulse and respiration rates restlessness, and vomiting The *stage of healing* is generally protracted

TREATMENT *General principles* (1) *Treat the shock* (*a*) Fluids can be administered by intravenous subcutaneous rectal and if possible by oral routes Normal saline combined with glucose and in severe cases plasma 1000 c cm forms the best method for such infusion (*b*) Relieve the pain and check restlessness of the patient by putting him to bed and injecting morphia ¼ gr (*c*) Give warmth to the body in the form of an electric bath Hemoconcentration should be looked for and dealt with immediately

(2) *Tannic acid treatment* The basis of modern treatment of burns is coagulation of the injured surface by tannic acid This method has important local and general effects Locally it is analgesic, pain, discomfort and frequent dressings are avoided on account of the presence of the coagulum In superficial burns sepsis is absent and healing is rapid General effects are that it lessens fluid loss from the body at the burnt area It probably helps by its analgesic effect to combat shock It prevents or minimises acute toxæmia

Aqueous solution of tannic acid 2 5 per cent is sprayed over the raw surface from an atomizer and dried by a current of hot air or by an electric bath This is repeated at hourly intervals 7 to 10 such applications generally suffice Otherwise a piece of lint soaked in solution is kept over the areas till the coagulum forms The lint is then removed and the coagulum dried

Coagulating solutions used are (*a*) Aqueous solution of 2 5 per cent tannic acid prepared by dissolving 7 5 gm of tannic acid in 300 c.cm of warm sterile water (*b*) Acriflavine (1 in 1 000) prepared by dissolving 0 3 gm of acriflavine in 300 c cm of warm sterile water In every case freshly made solutions should be used for spraying

2 Cleansing The burnt areas should always be cleansed under general anæsthesia (ether ordinarily peferred) Remove all epithelium which is loose or raised by blistering by cutting with a pair of clean and sterile scissors Swab the raw surface thus produced gently with ether or alcohol and then with hydrarg perchlor solution (1 in 1 000) After cleansing the coagulating solutions are sprayed over the areas

The above treatment applies to all types of thermal injuries and also for electrical burns

13 Carbuncle

It is an extensive gangrene of the subcutaneous tissue as a result of an acute inflammation due to the invasion of pathogenic microbes usually the *staphylo coccus pyogenes aureus* or *albus* The condition generally follows introduction of infections from outside or as a result of auto-infection in debilitated individuals usually suffering from some chronic disease such as diabetes albuminuria nephritis etc and in whom the body resistance is low Th sweat glands and the hair follicles of the part are primarily infected with organisms, the blood supply of the subcutaneous tissues is poor and very often predispose to the condition Though carbuncles may form on any part of the body, the common sites are the nape of the neck the back and the buttocks The disease is common in males over forty and appears as a hard painful infiltra tion of the subcutaneous tissue the overlying skin becomes red and œdematous, the swell ng ncreases n s ze peripherall and the ent a h ma of nd h *Causes*

and lead to intracranial complications

TREATMENT The general treatment of carbuncle is the same as of an acute infection The treatment of associated primary conditions namely diabetes or albuminuria is as important as the disease iteself Septic foci in the body should also be eradicated. Locally relief is always obtained by applying a hot fomenata tion over a dressing of perchloride of mercury (1 in 4 000) or magnesium sulphate compresses A thin paste of — sulphate 24 oz phenol 1 dr glycerine 1 powder while hot and add glycerine ar carbuncle Where the inflammation is the necrotic mass and in all carbuncles of the face drastic operative measures should never be encouraged Operative treatment aims at the total excision of the d seased mass When gangrene of the part occurs and toxæmia is intense the dead area should be immediately excised under a general anæsthetic and the cavity curetted till healthy tissue appears The after care of the wound is the same as that of ord nary surgical wounds Later on nutritious food tonics and a change of climate are advisable to aid a speedy recovery *Treatment*

14 Cerebrospinal Fever See page 844

CEREBROSPINAL FLUID The cerebrospinal fl iginates from the choroid plexus in the brain The pressure of the fluid i as the venous pressure but it is consi lerably less than the mal ssure (about one-sixth) The flow of the fluid can be revers nto tream by increase of the

osmotic pressure of the blood as in dehydration or intravenous injection of concentrated salt solution In meningitis the capillary cells of the plexus are disorganised and allow the protein constituents to pass into the cerebrospinal fluid The fluid passes out from the fourth ventricle into the cisterna magna Here the course of the fluid divides four fifths going over to the brain and one fifth round the spinal cord Blocking of the fluid produces internal hydrocephalus

Absorption of the fluid occurs by osmosis through the arachnoid villi The diffusion into the blood keeps pace
content of salts and other electro
cerebrospinal fluid In meningitis
of the spinal fluid is increased Repeated lumbar punctures and drainage are therefore practised to bring the pressure and amount to normal Lumbar puncture is nowadays commonly resorted to for ascertaining the character of the cerebrospinal fluid in normal health and disease for relieving its pressure in cases of

Normal cerebrospinal fluid (Values are in mgm per 100 c cm unless otherwise noted) Total quantity 100 to 150 c cm alkali reserve 58 to 63 specific gravity 1 007 to 1 009 pH (fresh) 7 4 pH (on standing) 8 3 pressure 7 to 9 mm Hg or 95 to 120 mm H_2O 5 to 7 mm Hg in children serum albumin about 4 serum globulin 20 to 30, urea 15 to 30 creatinine 0.7 to 1 5 dextrose 70 to 100 chlorides 720 to 750 The normal cerebrospinal fluid is as clear as water Turbidity or colour means abnormal condition The sugar content is always diminished in all conditions of acute suppurative meningitis it is also slightly diminished in syphilitic lesions of the central nervous system (Hopkins) It is increased in diabetes mellitus The chloride content is increased in nephritis and decreased in meningitis particularly in the tuberculous type (500 mgm per 100 c cm of the fluid or sometimes even less) The non protein figures are usually high in uræmia and in other nitrogen retention cases (100 mgm to 500 mgm per 100 c cm of the fluid)

Colloidal gold reaction Lange noted that the addition of electrolytes such as NaCl to solutions of ... the colloids but such precipitation ... lloids to the solution Normal ceret ... ange showed that fluids derived from ... ipitation on adding an electrolyte ... with fluids derived from cases of ... *ral nervous* system and a few cases ... ree lesions can be individually differentiated

There are three types of response—the paretic luetic and meningitic varying with dilutions A paretic response is obtained with general paralysis and luetic responses with tabes dorsalis and cerebrospinal syphilis while opinions vary regarding the proper interpretation of meningitic responses

Globulin test Normally the cerebrospinal fluid contains only a trace of protein but the amount increases in certain pathological conditions as in meningitis and cerebrospinal syphilis such increase particularly the globulin content is detected by the following test

Technique About one c cm of cerebrospinal fluid is added very slowly to the same amount of saturated solution of ammonium sulphate and if there is an [illegible]

Loculation syndrome The chemical changes in the cisternal and lumbar puncture fluid are of diagnostic value and constitute the syndrome The fluid stagnates below on obstruction in the spinal cord and the following changes are found —(1) Increase of protein up to 3 or 4 per cent (normal being 0 02 per cent) (2) Xanthochromia due to mixture with the fluid of the extravasated blood pigments from the congested meningeal vessels (3) Spontaneous clotting due to increase of the fibrinogen element in the fluid

VENTRICULAR PUNCTURE It is a difficult operation for which considerable skill and special knowledge must be available The main cavity of the lateral ventricle is situated close to the middle line and about 4 or 5 cm in front of the upper end of the Rolandic fissure It may be reached by puncturing the skull with a drill and introducing the needle 1 cm from the middle line and directing it downwards and slightly outwards

CISTERNAL PUNCTURE Theoretically the ideal place for obtaining cerebrospinal fluid is one or other of the lateral ventricles because there the fluid is formed and is found in the greatest quantity but to enter the chamber is difficult at an age when the anterior fontanelle has closed This operation is undertaken in cases of inoperable cerebellar tumours for the relief of severe headache and vomiting as well as threatening blindness and injection of drugs and various other substances into the ventricles as for ventriculography The cisterna magna (cisterna cerebello-medullaris) is the next largest collection of cerebrospinal fluid

Technique The patient is either sitting up or lying on one side The tip of the spinous process of the axis is felt and after sterilizing and anæsthetizing the sl in a graduated cisterna puncture needle is inserted in the middle line just above the tip It is then pushed forwards and upwards in the direction of the line joining the external auditory meatus with the glabella A slight increased
re
4
lar
2
of any accident happening if the needle is never pushed beyond the 6 cm mark

LUMBAR PUNCTURE. The technique is simple. The skin at the level of the third and fourth lumbar interspace (the spinous process of the fourth vertebra is on a line joining the highest points of the iliac crests) is carefully sterilized. The patient sits up or lies with his body well flexed A stout lumbar puncture needle is then inserted in the fourth interspace either in the middle line or one third of an inch from it it must be pointed forwards with a slight inclination upwards If the bone is encountered th needle must be withdrawn and reinserted at a slightly different angle In cases of repeated failures the third interspace may be tried In the adult the canal is reached at a depth of 2 to $2\frac{1}{2}$ inches and in children 1 to $1\frac{1}{2}$ inches *Lumbar punct*

Contra indication for lumbar puncture is tumour at the base of the brain as release of the fluid may result in a sudden pushing down of the brain on the medulla causing cessation of respiration and other vital functions

CHARACTER OF THE CEREBROSPINAL FLUID IN PATHOLOGICAL CONDITIONS

Type of case	Amount easily removed and pressure in mm H_2O	Cells per c mm and type	Total protein per cent.	W R	Colloidal gold reaction	Re-action pH	Urea, mgm per 100 c cm	N P N. mgm per 100 c cm	Chlorides, mgm per 100 c.cm.	Sugar mgm per 100 c.cm.
Normal	7 to 10 c cm (child) 90 mm (adult) 150 mm	1 to 5 mononu	0.015 to 0.03	–	–	7.45	20	25	720 to 750	100
Meningococcal meningitis	30 to 50 c cm 300 to 700 mm	50 to 3,000 polymorphs	0.05 to 0.5	–	+ Meningitic curve	6	30	35	650 to 700	0 to 30
Acute anterior poliomyelitis	10 to 50 c cm 300 mm	10 to 100 polymorphs later mononuclears	0.05 to 0.2	–	–	7.45	20	25	720 to 750	100
Tuberculous meningitis	15 to 30 c cm 300 to 700 mm	30 to 400 mononuclears	0.05 to 0.25	–	+ Meningitic curve	7	35	40	500	6 to 40
Loculation syndrome	Varies	Varies with cause	0.1 to 0.4	Varies with cause	Varies with cause	7.45	50	45	680	70 to 100
General paralysis	7 to 20 c cm 160 mm	10 to 50 mononuclears	0.05 to 0.1	+	+ Paretic curve	7.45	20	25	720 to 750	100
Cerebrospinal syphilis	7 to 20 c cm 160 mm	10 to 50 mononuclears	0.05 to 0.08	+	+ Luetic curve	7.45	20	25	720 to 750	100

After the puncture the patient should drink sufficient water during the following few hours and remain in a horizontal position for 12 hours Severe headaches following lumbar puncture are not uncommon, an intramuscular injection of pituitrin by increasing the secretion of the cerebrospinal fluid promptly relieves the headache in most cases so also intravenous injection of 100 c cm of normal saline solution

LIPIODOL IN SPINAL CORD COMPRESSION Since lipiodol was introduced in 1921 by Sicoid of Paris considerable use has been made of it for the localization of the level of subarachnoid block

Indications The common indications for lipiodol injections are new growths of the vertebræ new growths of the extra dural space meninges nerve roots or spinal cord inflammatory thickenings or cicatrisations resulting from traumatic hæmorrhage and syphilitic or suppurative meningitis

Lipiodol is a 40 per cent solution of iodine in poppy oil and is opaque to X rays It can be injected by cisternal or lumbar puncture The latter method is safer and is recommended in preference *Lipiodol injections*

15 Cholera. See page 761

CIRCULATORY FAILURE This is a state of collapse due to failure of the function of the cardiovascular system resulting in a diminished cardiac output and a fall in blood pressure Two forms of circulatory failure are recognised a central cardiac type with impairment of the ventricular propulsive force and a peripheral vascular type where the heart does not receive an adequate venous return The five type is associated with myocardial damage and in the second type a distinct lesion must be present in the peripheral vascular system though one is dependent on the other Sudden impairment of the coronary circulation might also precipitate the condition

Acute cardiac failure Formerly acute dilatation of the heart was thought to be the chief causal factor in acute cardiac failure but electro-cardiographic findings and radiological observations do not support this Dilatation of the heart is a rather gradual process as a result of chronic continued failure. Intervention of a sudden abnormal rhythm is responsible for impaired functional activities of the ventricles Ventricular fibrillation in which each muscle fibre is having its own rhythm and in an incoordinated manner, is a potent cause of sudden death as in angina coronary thrombosis, during chloroform anæsthesia and in digitalis poisoning Symptoms such as syncope, dyspnœa cardiac pain etc in sudden ventricular failure have led to the recognition of the following clinical types —(1) *Cardiac syncope* Abrupt fall in blood pressure leads to cerebral anæmia resulting in loss of consciousness The condition is also met with in coronary thrombosis and disturbed rhythm of the heart Syncopal attacks are liable to occur if the ventricular rate falls below twenty a minute In Stoke Adams syndrome a series of symptoms, such as faintness a giddiness and pallor appear and may even end in complete loss of consciousness Injection of 0 5 c cm of adrenalin (1 in 1000) might cut short such an attack A long needle is pushed through the fourth intercostal space keeping the needle close to the sternal border, until the cavity of the right ventricle is reached and a little blood is withdrawn to see that the needle is inside the cavity of the ventricle The drug is then injected into the cavity of the heart In sudden stoppage of the heart during chloroform anæsthesia massage of the heart through an abdominal incision is of great value while artificial respiration is resorted to *Cardiac fa*

Cardiac failure with pain Coronary thrombosis is the cause of sudden death in this condition There is a severe and prolonged seizure with shock pallor subnormal blood pressure and temperature Diagnosis is made by an electrocardiogram Morphia (½ gr) should be injected to relieve the pain and may be repeated if required in 15 minutes Absolute rest warmth and small doses of brandy should form part of the treatment Nitrites are useless and strychnine is of little value

If pulmonary oedema is present give morphine ½ gr with atropine sulphate 1 mgm (1/60 gr) intramuscularly Aminophylline 0 25 to 0 5 gm (4 to 7½ gr) intravenously slowly taking 5 to 10 minutes, diluted in 10 to 20 c cm of distilled water, if shock place patient in shock position and apply warmth, elevate foot of bed Give caffeine benzoate 7½ gr intravenously Adrenaline 0 2 c cm of 1 in 1000 subcutaneously or ephedrine ½ gr, 200 c cm of plasma may be given intravenously

General The patient must be kept at absolute rest in bed for 6 weeks or longer Very little food is given for first 72 hours and this should chiefly be in from of fluids tea coffee soupe gruel etc In the 2nd week diet should be gradually increased to 1000 calories Patient encouraged to move in bed Keep bowels open but bedpan must be used From 3rd to 6th week diet is slowly increased to 1200 calories

Convalescence Patient should remain in bed for 4 to 6 weeks more and in this period gradually allowed to get up and move about

ANTICOAGULANT THERAPY In the first 72 hours of attack give Dicumarol ... s therapy ... facilities ... pts should

For mild pain give codopyrine 3 to 4 times daily or phenobarbital 1½ gr or chloral hydrate 30 gr at bed time If premature beats are accuring give quinidine sulphate 3 gr three times a day If auriculor fibrillation is present digitalize rapidly ...
when arr
every 6 d
subcutan
mouth

CONGESTIVE HEART FAILUR
vascular disease, cardial infarcti

Aminophylline
in severe cases
if no relief

Chronic Rest in bed Diet should contain not more 1 0 gm of sodium chloride in 24 hours If vitamin deficiency give vitamin B complex intramuscularly If hypoproteinemia give more protein in diet Digitalize with digitoxin or by powdered digitalis leaf 0 1 gm (1½ gr three times daily for a week and then 1½ gr daily as maintenance dose Aminophylline 0 5 gr may be given in 10 c cm of distilled water daily

Diuretics 6 0 gm of ammonium chloride daily by mouth may be given Aminophylline 0 5 gm mercurial diuretics e g salyrgan or salyrgan—theophylline

intramuscularly These should only be given if renal function is not seriously impaired A low sodium diet is important

Cardiac dyspnoea

Acute cardiac dyspnoea Cardiac dyspnoea is a sign of left ventricular exhaustion in hypertensive heart disease less often in coronary disease or syphilitic aortitis Sudden pulmonary engorgement precipitates the attack Cardiac asthma is usually nocturnal with symptoms of cyanosis, pallor, tachycardia and rapid breathing but without bronchial spasm Pulmonary embolism also causes sudden dyspnœa cyanosis and collapse Injection of morphia (¼ gr) combined with atropine (1/1000 gr) is often known to relieve the distressing condition Withdrawal of 10 to 15 oz of blood by venesection also improves the condition and particularly in pulmonary œdema A severe case might necessitate an intravenous injection of strophanthin (1/100 gr) After the acute stage, prolonged rest in bed and a course of digitalis by mouth are necessary

Palpitation Paroxysmal tachycardia may cause faintness dyspnœa præcordial pain or even syncope If the myocardium is badly damaged acute failure may suddenly develop The attack can be cut short by inducing vomiting or by pressing over the carotid sheath in the neck Injection of morphin (¼ gr) may relieve the condition If signs of chronic heart failure develop complete digitalisation of the patient may be necessary Intravenous strophanthin (1/100 gr) is of great value in acute failure If diagnosis of tacycardia of ventricular origin is confirmed by electrocardiogram quinidine sulphate in 5 gr doses is given by mouth and the dose is repeated hourly up to a total of 30 gr or until the attack ceases In very urgent cases, quinidine has been given intravenously

Peripheral failure

Peripheral vascular failure Paralysis and subsequent dilatation of the peripheral vessels resulting in stasis of the circulating blood in the splanchnic area is the principal factor in peripheral vascular failure The heart does not receive an adequate amount of blood to contract upon the myocardium bears the brunt and the nutrition of the heart suffers This vascular paralysis may be central in origin or may be due to a direct toxic action of histamine like bodies on the vessels themselves It is seen in surgical shock after severe injuries hæmorrhage in certain toxæmias and in diabetic coma the common symptoms are subnormal blood pressure pallor, cold extremities, sweating sighing respirations and extreme prostration

Fainting ty

Clinical types (1) *Fainting* This is a type of transient vascular failure The main feature is cerebral ... of the parasympathetic sy... consciousness is gradual ... keeps down for some time ... It

(2) *Vaso-vagal attacks or Gower's syndrome* The onset of syncope is more ... absence of signs of organic heart lesions confirm the diagnosis

TREATMENT *Peripheral failure* The underlying principles of treatment should be to increase the volume of the circulating blood to restore vascular tone

and to lessen cerebral anæmia The treatment is the same as for shock, the foot end of the bed should be raised and bandaging the limbs may prevent venous stasis and facilitate venous return to the heart The patient should be kept warm under blankets or with an electric bath, where available Fluids, in any form sho ld b d

y, to increase the blood volume
In cases, where hæmorrhage

nt of art

Gradual heart failure Gradual heart failure is apt to supervene in a case of old standing valvular or myocardial disease In the management of such a case the chief indication is to prevent or delay the onset of failure In order to prevent breakdown of compensation and heart failure the patient s mode of life must be regulated Over exertion is particularly to be avoided and the patient should not do more than he can do without getting out of breath and this is true for the myocardial cases particularly At least nine hours a day should be spent in bed The diet should be one designed to keep down body fat and fluids to a minimum and also to prevent flatulence as far as possible It should be a dry spare diet from which articles rich in cellulose (vegetables and raw fruits) are eliminated and in which starchy foods are restricted Crisp toast and rusks should be substituted for bread and potatoes should be taken very sparingly The chief

lay The most useful drug to obviate failure
of myocardial degeneration with threatened
viduals) and also in cases of mitral disease

iodide may be given combined
broken down and failure has
rest the heart by lessening its work, to remove peripheral obstruction to the circulation such as dropsy, to increase the force of the systoles and to prolong the diastoles thus improving the efficiency of the contractions and lengthening the resting time of the heart Complete rest in bed is imperative Diet should always be restricted in severe cases of heart failure
and milk about 2 pints a day may be allowed
doses (1 to 1½ dr of the tincture daily) and
may be combined with it The following i
dropsy —acetate of potassium 20 gr, tincture
1 dr and infusion of scoparium to 1 oz, make it to 6 oz and one twelfth part to be taken with a little water every four hours The signs and symptoms due to cumulative effects of digitalis should always be watched for in thes cases To relieve congestion of the liver, mercury may be combined with digitalis as powdered digitalis, squill and pill of mercury each 1 gr one pill to be taken every four to six hours Diuretin is an effective diuretic in doses of 10 gr, three times a day Symptomatic treatment is given to allay irritability of the stomach, to promote sleep and to relieve the bowels Vomiting may be allayed by a bismuth mixture For the promotion of sleep there is nothing better than morphia and these patients stand morphia well To promote the action of the bowels a mercurial at night followed by a saline purgative in the morning is very effective, particularly in cases accompanied by dropsy In cases of cyanosis continuous inhalation of oxygen is indicated If there are signs of engorgement of the right side of the heart venesection and withdrawal of 15 to 20 oz of blood should be done

16 Climatic Bubo, Lymphogranuloma Inguinale and Allied Conditions
See page 891

17. Coma

It is a state of unconsciousness from which a patient cannot be roused by ordinary means The chief causes are head injuries, the effects of drugs like opium and alcohol, diseases such as epilepsy, uræmia, diabetes mellitus, cerebral diseases including vascular lesions tumours, abscess of brain, meningitis and encephalitis, acidosis, malignant malaria, and terminal stage of many other diseases

DIAGNOSIS (1) Inquire into the previous history of the patient particularly with regard to the presence of renal and cardio vascular disease, diabetes mellitus and epilepsy (2) Inquire into the habits of the patient regarding alcohol and other drugs (3) Ascertain the nature of onset of coma whether sudden or gradual whether associated with injury of the head or convulsions (4) Examine thoroughly the comatose patient regarding age and general build general appearance, nature and type of the breathing abnormal odour in breath, presence of blood on lips, other external signs of injury, condition of the pupils as to size, reaction to light etc, condition of the cardiovascular system including blood pressure, any evidence of paralysis of the face and limbs Test the various reflexes Examine a specimen of urine (catheterise if necessary) for sugar, albumin, casts and ketone bodies Do a lumbar puncture Do an ophthalmoscopic examination of the fundus oculi for optic neuritis, albuminuric retinitis and hæmorrhages Record temperature and save all vomits Examine the blood, especially for malarial parasites

DIFFERENT TYPES OF COMA *Alcoholic coma* This coma is rarely deep or complete, pupils are equal or dilated, conjunctival reflex is usually present breath has alcoholic smell, inco-ordination of movements but no paralysis

Treatment Wash out the stomach and administer stimulants Treat according to symptoms

EPILEPTIC COMA History is very important, as epileptic fit precedes coma Consciousness is completely lost pupils are inactive to light and conjunctivæ are insensitive *Types of Co*

Treatment The immediate treatment consists in loosening the patient s tight clothing collar, etc., and removing false teeth if any It is useless to try and arouse the patient If there is collapse, stimulants may be given

URÆMIC COMA (1) History of previous kidney disease (2) Prodromal symptoms such as headache, nausea and [illegible]
comatose there may be convulsions (3 [illegible]
be hissing' or Cheyne Stokes type (Renal [illegible]
and casts and the quantity is scanty (5) [illegible]
urea and non protein nitrogen are high

Treatment Do a venesection and remove as much as 15 to 20 oz of blood thereby reducing the amount of circulating toxin Administer intravenously nearly the same amount or a little less of normal sterile saline with glucose to further dilute the circulating toxin Administer normal saline with sodium bicarbonate and glucose per rectum Do a lumbar puncture to reduce cerebral œdema Prescribe compound jalap powder to be followed by a saline purge for free purgation Hot air bath by electric cage for sufficient diaphoresis is needed If the patient can swallow prescribe alkaline mixture with calcium diuretin Linseed poultice or dry cupping over the lumbar regions, to facilitate the secretion of urine, is useful. To control the spasm during convulsions administer a few

whiffs of chloroform Chloral hydrate and bromides are given to keep the patient quiet nitrites are given if the blood pressure is high Morphine should be cautiously administered to check restlessness and delirium and to prevent recurrence of the uræmic fits Calcium lacate may be given if vomiting and hiccough are present Diet should be very low in proteins

DIABETIC COMA See Diabetes page 162

APOPLECTIC COMA May be due to (*a*) cerebral hæmorrhage (*b*) cerebral thrombosis and (*c*) cerebral embolism

Cerebral hæmorrhage Diagnosis History of the case age of the patient usually 45 to 65 years Onset is sudden and the coma is deep and progressive The blood pressure is high and pulse is full and bounding The pupils are unequal and do not respond to light There is conjugate deviation of eyes The respiration is hurried noisy sterorous and may be of the Cheyne Stokes type Paralysis of the face arm and leg on the side opposite to the lesion Cerebrospinal fluid comes out under pressure and is mixed with blood

Cerebral thrombosis History of the case onset is gradual the patient is conscious the cerebrospinal fluid does not contain blood Occurs at early age.

Cerebral embolism Diagnosis History Onset is sudden evidence of mitral stenosis infective endocarditis or any other source of emboli consciousness usually not lost, occurs in early life

COMA DUE TO HÆMORRHAGE INTO THE PONS History of direct head injury a latent period and then a coma

OPIUM POISONING History of the case pupils contracted breathing slow and Cheyme Stockes type

Treatment Wash out stomach and examine contents

COMA DUE TO HYPERPYREXIA This is an important cause in the tropics and commonly occurs in malignant malaria Examine blood for the presence of the parasites Coma due to hyperpyrexia after sunstroke is also common in the tropics (See page 73)

18 Common Cold *See page 919*

The catarrh affecting the nasopharynx the larynx and the bronchial tubes is known as common cold It is caused by a filterable virus The inflammatory condition affecting the mucous membrane of the upper respiratory passages is attributed to external irritants and invasion by pathogenic bacteria Inclement weather such as damp cold and chill by lowering the resisting power of the individual very often predispose to microbic invasion of the parts In all cases of acute common cold there is an infection by microorganisms such as the *Friedlander's bacillus H influenzæ Bacillus septicus Micrococcus catarrhalis* and pneumococcus which may occur separately or combined The condition is usually infectious and is very liable to pass from one member of a household to another The infection induces inflammatory reaction and the catarrh primarily starts in the nose Deformity and deflection of the nasal septum the presence of a ridge or spur on the septum are causal factors as these help in the retention of the secretions which keep up the infection Recurrent attacks of cold in susceptible individuals render the nasal mucous membrane more susceptible to inflammatory changes Children are more susceptible to colds than adults on account of variety of predisposing causes The presence of adenoids is by far the commonest cause of nasal catarrh in children Children brought up under bad

hygienic conditions are predisposed to this malady Deficient and stagnant ventilation and dusty atmosphere also contribute a great deal towards the causation of this common disease

TREATMENT All nasal abnormalities should be corrected by surgical operation Adenoids in children should always be removed and such measures often cure the complaint unless chronic catarrhal changes have supervened General treatment is useless unless such abnormality is properly dealt with As regards extranasal causes a careful search should be made into the general health, and hygiene of the patient Clothing should be such as to promote the healthy action of the skin Some form of exercise should be enjoined by the patient before the morning bath When the site of infection is within easy reach of drugs it is easy to abort an early attack This is done by washing the microbes out of the part with a weak antiseptic lotion or normal saline which is used both as a gargle and a nasal douche The antiseptic lotion for the nasal douche should be comfortably warm (100°F) alkaline in reaction and isotonic with the blood plasma A useful prescription for this purpose is bicarbonate and biborate of sodium each 4 gr, benzoate of sodium 1/6 gr oil of eucalyptus 1/12 min, menthol 1/24 gr, and water to 1 oz to be mixed with warm water and used as a nasal douche It can also be used as a gargle Oils such as eucalyptus, well-vaporized or atomized in a suitable apparatus and inhaled vigorously and frequently both through the mouth and nose are exceedingly useful The household remedy of Friar's Balsam (1 dr to a pint of hot water) inhaled from a wide-mouthed jug is very efficacious A combination is oil of eucalyptus 20 to 40 min, menthol 10 gr to 1 dr, liquid paraffin to one oz can be used as a spray In case of an acute attack rest in bed for a few days is imperative During this time a mild mercurial pugative such as calomel in divided doses followed by a saline aperient in the morning is very helpful When constitutional disturbances such as headache and fever are present, Dover's powder 5 to 15 gr or preparations of quinine are of special value Quinine is said to be a general tonic after a cold Sedative expectorants are most effective during the acute congestive period when the cough is hard and accompanied by slight mucus *Treatmen*

Chloretone nebulant Chlorbutol 15 gr, camphor 37 gr, menthol 37 gr, cinnamon oil 4 min, light liquid paraffin to 4 oz To be sprayed frequently with an atomiser

19 Conjunctivitis

Inflammation of the conjunctiva may be acute or chronic It is due to a variety of causes such as smoke, irritant vapours trauma errors of refraction, etc It also occurs in certain constitutional diseases but the most important is one of microbic origin the common organisms being pneumococcus, gonococcus and certain bacilli Conjunctivitis should therefore be considered as an infectious disease The common symptoms are gritty sensations photophobia a purulent discharge and sticking of the eyelids in the morning *Causes*

TREATMENT The diseased eye should never be bandaged as the discharge

ld be repeated as often as *Treatment*
Of the drugs prescribed
to an oz, argyrol (20 to

25 per cent) protargol (2 to 5 per cent) silver nitrate (1 to 2 per cent) and tannic acid (1 per cent) are most commonly used Some are irritating and the selection of such drugs should be made to suit individual cases Argyrol is very commonly used nowadays in the treatment of the common forms of conjunctivitis

A few common types of conjunctivitis. (1) *Acute catarrhal conjunctivitis* This is a muco purulent type of conjunctivitis the exciting cause is the pneumococcus Argyrol should be prescribed in the form of eye drops three times a day early in the affection and later on zinc sulphate is used If there is sticking of the eyelids on waking in the morning ointments of yellow oxide of mercury (½ to 1 per cent) perchloride of mercury (1 in 3 000) or boric acid (B P) may be applied to the conjunctiva at bed time (2) *Gonorrhœal opthalmia* The exciting cause of this type of conjunctivitis is the gonococcus and when seen in the newborn it is called *ophthalmia neonatorum* The routine method of treatment in maternity practice is to instil drops of silver nitrate (1 per cent) in the eyes of the new born infant where infection is suspected Free lavage of the conjunctival sacs with Condy s lotion (1 in 4 000) should be advised Silver nitrate (2 per cent) solution should be applied every morning to the everted lids which should be always kept clean and dry It is highly infectious (3) *Trachoma* This is a very chronic form of conjunctivitis The main treatment consists in the application to the everted lids of 2 per cent silver nitrate in the early stages and of copper sulphate stick in the later stages of the diseases This should be done three times a week It is also highly infectious (4) *Phlyctenular conjunctivitis* This is seen in debilitated children and the disease often runs a chronic course Application of yellow oxide of mercury (1 per cent) as ointment or dusting of calomel powder once a day to the phlyctenules of the eye is beneficial The pupils should always be dilated with atropine ointment (1 per cent) where the cornea is involved The general condition of the patient should be improved with fresh air nutritious and assimilable food tonics and cod liver oil

20 Constipation

It is essentially a functional disorder of the large gut and so is only a symptom but the condition is so common that it is almost considered as a disease in itself The treatment of the condition is more important as it is such an important ætiological factor in the development of so many chronic diseases that may lead to a fatal issue Chronic intestinal stasis is also held responsible for the development of the symptom complex of auto intoxication Before adopting any special meth with other recent physical agents investi gate condition The treatment of constipation propc tment of the patient himself rather than that of the disease so that a careful and close scrutiny has to be made regarding his general habits the quantity quality and frequency of meals any previous intestinal diseases and the general muscular state and build of the patient In the case of female patients in addition to those already mentioned an enquiry should be made into the obstetrical history of the patient along with other associated symptoms

In diagnosing the definite cause of constipation the three types of colon with characteristic features have to be considered as the line of treatment differs accordingly

Spastic colon This is a vagotonic state of the large gut The descending colon is hard rigid contracted and tender The part is extremely irritable due

to over purgation faulty dietary undigested irritating food particles and the spasticity is sometimes secondary to a septic focus elsewhere Here constipation is irregular and response to purgatives is uncertain The patient suffers from
xcess of
c colon
health

The abdomen is lax and pendulous The constipation is persistent and motions are offensive due to cæcal stasis and putrefaction of the protein portions of the diet The diet also in these cases consists of a greater percentage of proteins which offer a poor stimulus to the colonic activity *Dyschesia* Hurst regards this to be a rectal condition often associated with atonic colon due to a failure of response to the desire for defæcation The rectum is inattentive to the fæcal mass and does not in these cases exert itself to evacuate its contents Such a condition is generally associated with muscular damage abdominal or perineal

meal and also detecting other local conditions such as new growths in the colon or rectum

Acute constipation In acute obstinate constipation of a few days duration and in the absence of any mechanical obstruction or inflammation a pint or two of an ordinary soap sud enema should in the first instance be always tried and if no results follow a compound enema consisting of castor oil olive oil tincture asafœtida and oil of turpentine followed again by another soap sud enema sometimes gives encouraging results This routine is of particular value where the *Acute constipation*
a ctions
o cases
o dose
of castor oil is also worth trying in these cases

Chronic constipation In chronic constipation with signs and symptoms of auto intoxication due to intestinal stasis thorough irrigation of the gut is most helpful Long continued physical therapy with appropriate medicinal treatment and diet therapy are all that are needed for the treatment of such conditions Habitual constipation is also a type of chronic constipation and the secret of *Chronic constipation*

for a long time

In the atonic type of constipation increase and maintenance of tone and contractility of intestinal muscles should be aimed at Physical therapy is useful and sinusoidal currents are more beneficial in these cases than the treatment with drugs A pill consisting of strychnine aloin and belladonna is often prescribed in these cases Increase in mass and fluid should precede an actual stimulation of the gut and salines may serve the purpose

cases of stasis whether spastic atonic or dependent on anatomic fault

In dyschezia, correct all local errors, if any, of the rectum Of the purgative drugs, liquid paraffin, agar agar, senna, liquorice powder are often prescribed. The *former two lubricate and facilitate the* passage of the bowel contents and defæcation is no longer painful Before instituting any line of treatment, a local examination of the rectum is most essential

DIET THERAPY Diet is the most important ætiological factor in the causation of constipation and is probably responsible for it in the majority of cases A [illegible] long [illegible] In [illegible] *rapy* and drugs should come in occasionally

A complete and thorough enquiry is to be made into the food intake of the *individual, its frequency, quantity* and quality The prescribing of a proper diet varies with the types of cases and so a case history is most important In the atonic type, stimulation of the gut is necessary and hence the bulk of meals should be increased The coarser cereals, brown bread fresh green vegetables salads, fresh fruits be taken in abundantly for this purpose The daily fluid in take should also be large The protein intake should be reduced to limit putrefactive processes inside the gut The supply of vitamin B and its storage inside the body should be freely encouraged in the treatment of these cases In *the spastic type of case,* t [illegible] *desirable* to stimulate any further [illegible] at, coarse vegetables, fruits with p [illegible] the softer forms of meat, simpler fruits and vegetables are allowed in their place Sugars favouring fermentation should be reduced Feeds should include a liberal supply of dairy products, milk, citrated if necessary cream, raw or lightly boiled eggs and butter, the idea being to soothe the bowel

In dyschezia increase in mass and quality should be aimed at Feeds of a *soft, oily and lubricant nature, such as butter, cream and fats should be taken* abundantly Proteins should be reduced with a corresponding increase in carbo hydrates like cereals potatoes bananas and other forms of starch The idea here is to lubricate the passage during evacuation *of the contents of the gut*

PHYSICAL THERAPY The co-operation of the patient with the practitioner is desirable in correcting *the faulty personal habits of the individual It is not* sufficient to cleanse the bowel only once, but it must be kept clean to avoid sub sequent complications following intestinal stasis The necessity of a complete and thorough evacuation of the bowel, daily, cannot be overestimated Hurries and worries of daily life are direct hindrances to response to the call of nature and these with other factors have sometimes deleterious effects on the intestinal activities of the individual The intake of a tumblerful of cold water on waking *in the morning sets off a gastro colic reflex necessary for the purpose* The tone of the *abdominal muscles* should be improved both in young and elderly people with suitable exercises and massage Sometimes the sitting posture at stool is faulty and this should be corrected The intestines are slung from the back and a better adjustment and *co ordination of all the forces concerned in the act of* defæcation are served only when the body is bent forwards or if possible when one rests with the elbows on the knees

Massage Abdominal massage and exercises for abdominal muscles have been practised for years and the technique has been improved and developed in the hands of Ling the founder of the Sweedish system of exercises Along with massage proper diet therapy should be advised and the correction of other faulty

habits of the individual should be aimed at as all these combined go a long way

Abdominal massage

repeated four times a week

Special types of massage recommended for the purpose are (*a*) Colonic *self massage* (*b*) The folding exercise (*c*) The pulling type Regarding the details of the above types of massage, special treatises dealing with these should be consulted

Exercise In the tropics the enervating influence of the climate makes people more ease loving and they are quickly fatigued with a less amount of work than people inhabiting countries in the temperate zone Though Indian types of exercises are varied and interesting very few take them regularly As people grow old they give up all sorts of exercises and settle down to a sedentary life thereby making a good base on which constipation can develop They are often obese persons with a lax pendulous abdomen and without power of exerting the abdominal muscles during defæcation Women folk in the tropics suffer most and of these particularly *pardanashin* ladies with sedentary habits Damages to the perineal muscles and other accessory muscles concerned in defæcation during repeated parturitions are also contributory causes in the later development of constipation in those women The Western system of exercises including those of Muler and Hornibrook may not suit people in the tropics but even such simple exercises as walking running or swimming are not regularly practised by them The neuromuscular system is never properly developed and with advancing years this is deranged and refuses to work properly resulting in intestinal stasis and similar functional disorders of the body system

Types of Exercises

Lavage treatment Per rectum The keynote of this particular type of treatment is to give the bowel time to rest after clearing away the stagnant debris

Lavage by the mouth of the water regime The patient is asked to drink two tumblers of cold water on waking in the morning The water intake may be increased to about a quart and the patient is then asked to lie on his left side for a quarter of anhour followed by five minutes on his right side before getting up The water may be warmed a little to suit the patient The patient may be allowed to take the purgative drug he is used to along with it If during the early part of this treatment the quantity of urine passed is increased after such water intake he should be advised to lie down on his side for a prolonged period of time This treatment has given encouraging results though the underlying rational physiological process operating is not clear This technique of water regime had been practised by physicians in the old days in the indigenous system of medicine and it is well worth reviving in modern times with the advancement of physical therapy

Lavage

Medicinal treatment Drugs The list of purgatives and the proprietary drugs on the market is enormous and the difficulty and confusion are mostly experienced by practitioners in the selection of the drugs

Medicinal Treatment

Paraffin group The paraffin group of purgative drugs is most extensively used for their harmless action and the absence of after-effects They can be safely prescribed for the aged and the young alike and even in cases of full term pregnant women They are useful in chronic constipation and the action is purely mechanical as a lubricant facilitating the passage of hard fæcal masses They are never absorbed and so there is no systemic effects They have a certain amount of antiseptic action on the bacteria of the intestine Their action is

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enhanced by combining them with cascara The disagreeable effects are leakage of the oil when flatus is passed Very prolonged use is said to give rise to irritation and decrease of absorption of foodstuffs from the intestine *Dose*—1 to 2 oz

Agar agar It is a colloid laxative acting purely mechanically by increasing the bulk of the contents of the bowel It is not acted upon by digestive juices and is not absorbed As it does not actually stimulate the peristaltic activity of the gut it should be combined with other mild laxatives in the atonic type of constipation Its disadvantages are that it retards absorption of foodstuffs and favours the growth of bacteria

Glycerine It is generally used for rectal injections or is used in the form of a suppository The action is due to irritation of the mucous membrane of the rectum and the drug causes evacuation of the lower bowel The drug suits infants and young children where oral administration of a purgative is difficult and undesirable

Castor oil Of all purgative drugs castor oil is most extensively used and is a common household remedy for constipation In chronic constipation in entero intoxication and in diarrhœa due to indigestion and dietetic errors the
d the bowel of its irritating
c tinuous use in habitual
c n account of its nauseat
ing taste but is given as an emulsion flavoured and sweetened with some agent Infants tolerate the oil better than adults Castor oil itself is inert but is saponified in the gu
fresh fatty acids
by lubrication Ca
since as soon as a sufficient quantity is hydrolysed the resulting cathartic action carries away the superfluous oil The action begins in the duodenum and passes down through the jejunum into the ileum and colon It produces thorough evacuation of the bowel and is therefore prone to be followed by constipation *Dose*—1 to 2 oz

Croton oil The drug is a purgative of emergency for its prompt action and is special use in apoplectic coma in cerebral hæmorrhage and in lead colic when other purgatives fail to act

Mercurials Calomel is commonly used as a purgative drug Because of its cholagogue property, the drug is often the cathartic of choice in an attack of acute indigestion accompanied by constipation with white pasty stools coated tongue and other signs of biliousness The drug should always be given in small repeated doses ¼ to ½ gr every half an hour as it is changed to grey oxide inside the bowel exerting its cathartic effects but when a large dose is given at a time a portion of it is only so changed the rest passing unaltered or being absorbed and exerting toxic effects Calomel acts mainly on the small intestines its action on the large gut being mild It has a certain amount of antiseptic action and putrefaction in the intestine is decreased by its use as shown by decrease in the bacterial content of fæces and sulphates in the urine A saline purgative should always be taken in the morning to ensure evacuation of the large gut The drug should never be prescribed for habitual constipation for its repeated use might result in ptyalism and other signs of mercurial poisoning

Anthracenes Cascara sagrada is considered to be one of the best intestinal stimulants in the atonic type of constipation It has the special advantage of maintaining a regular effect even with continuous and prolonged use The main

therapeutic action of the drug lies in improving the tonicity and excitability of the intestinal musculature Griping after its use is rare and the tendency to after-constipation is slight The dose can be slowly reduced tailing off finally to cessation It may be safely prescribed even to pregnant women nearing term Several palatable preparations are sold to suit the taste of patients and of these cascara evacuant (P D & Co) is well known A teaspoonful in the evening produces the desired result in the morning

Senna It is a commonly used and useful vegetable cathartic producing copious stools in 8 to 10 hours In habitual constipation an infusion of senna pods left overnight in a glassful of cold water is an effective preparation evacuating the entire bowel without griping The drug causes griping when prescribed alone and hence it is often prescribed with ginger cinamon and similar carminatives to prevent this Senna mainly acts on the large intestines Pulv glycyrrhiza compound contains this drug and sulphur and is specially advised for pregnant women and in cases of hæmorrhoids ordinary defæcation is painful It is best taken at night to act in the morning

Rhubarb The drug is more an astringent bitter and stomachic tonic than a cathartic It causes an evacuation of the offending putrefied foodstuffs due to

in overcoming
of the drug is
slow and it causes griping

Hydragogues They are not common remedies against simple constipation These drugs are particularly useful in general anasarca of the body in dropsy of cardiac or hepatic origin in congestive or inflammatory states of the meninges

pills

Salines Salines are very commonly used in habitual constipation by elderly people in the form of some sort of effervescing drink on waking early in the morning These act by altering osmotic tension and increasing fluid retention or reducing its absorption from the gut Salines should be followed by intake of a copius amount of plain water so as to increase the bulk

Magnesium sulphate It is a common household remedy and is an efficient evacuant producing several watery motions without any griping The drug is of particular value in cleansing the bowel of offensive materials relieving cerebral congestion or general anasarca of the body It is also used in cases of acute food poisoning and indigestion In lead colic a prescription containing magnesium sulphate 1 oz morphine sulphate ¼ gr dilute sulphuric acid 30 min and peppermint water up to 4 oz is very useful One tablespoonful of this with an ounce of water to be taken every hour till free purgation sets in

Atropine The drug is most reliable and specially reputed for its specific vagotropic action and is very useful in the relief of spastic states of the intestine where the vagus is overactive The drug tends to normalize the tone and contractility of the gut and cuts short the irregular spasms of the intestinal muscles *Uses of Atr*
The pure drug is superior to belladonna and the commencing dose should not exceed 1/150 gr and be repeated three times a day

The importance of treatment of constipation in the tropics with so many varying ætiological factors cannot be over emphasized No hard and fast rules can be laid down for its treatment essentially depends on the merits of the case Treat the patient and not the condition should be the idea of the practitioner Drugs only help and probably very seldom cure such conditions Correction of personal habits and the institution of appropriate diet and physical therapy are all that should be aimed at by general practitioners in laying down a general line of treatment of constipation

21 Convulsions

(a) *In children*

The causes of convulsions are (1) violent diarrhœa and vomiting (2) in any pyrexia and corresponding to what would be a rigor in an adult Older children are liable to fits at the onset of lobar pneumonia pyelitis or tonsilitis (3) rickets especially ...
phimosis an
m common in
signs) whic
intravenousl

When the child is in a fit (1) Try to check the convulsions Put the child in warm bath and sponge its head with cold water and artificial respiration by gently squeezing the chest with the hand should be resorted to Inhalation of ammonia is also beneficial (2) prevent recurrence by potassium bromide in plenty of water and (3) lastly investigate the cause and treat accordingly

(b) *In adults*

In adults convulsions may or may not be accompanied by loss of consciousness (A) When consciousness is retained the causes are (*i*) poisoning by drugs like strychnine (*ii*) Jacksonian epilepsy (*iii*) tetanus and (*iv*) tetany

(B) When consciousness is lost the causes of convulsions may be (*a*) epilepsy which may be treated by injection of sodium luminal 5 gr or apomorphine 1/6 gr (*b*) Stokes Adam s disease in which case intracardiac injection of 5 min of adrenalin has given hopeful results followed by subcutaneous injection of adrenalin four times a day or barium chloride 1 gr by mouth three times a day to prevent recurrence (*c*) poisons other than strychnine such as cocaine chronic alcoholic poisoning etc (*d*) cerebral hæmorrhage (*e*) uræmia (*f*) general paralysis of insane, (*g*) hypoglycæmic condition due to overdose of insulin (for treatment see page (1049) (*h*) eclampsia which is treated with chloroform liquid glucose etc.

Emergency treatment of fits accompanied by coma (A) Prevent the patient from hurting himself (B) do not attempt to hold him down (C) put something between his teeth so that he may not injure his tongue (D) loosen clothing and start artificial (Schafers) respiration (5) when convulsion ceases give large doses of potassium bromide in water to prevent recurrence of fits

22 Cough

It is one of the cardinal symptoms of the diseases of the respiratory system
ce
ila
is
nd

pleuræ are those of acute and chronic bronchitis acute pleurisy pulmonar emphysema, bronchiectasis pulmonary tuberculosis fibrosis of the lungs anc pulmonary neoplasms The nature of the cough should always be stud ed as it gives a clue to the diagnosis of the particular disease and proper treatment in time may save the patient from long years of suffering The tonsil and adenoid cough is of a dry nature the long uvula cough is also of a dry nature and occurs at night when the patient is in bed The pharyngitis cough due to dyspeptic conditions tends to occur chiefly in the morning and is non productive The and non productive of chronic bronchitis is painless and associated with hoarseness In tracheitis the cough is sever and is totally out of proportion to the physical signs found in the chest The cough of acute bronchitis is painful and non productive of chronic bronchitis it is painless and associated with copious expectoration of mucoid and mucopurulent sputum The cough in acute pleurisy is most painful short and dry and is particularly common in the early stages of pneumonia when the pleuræ are involved In pulmonary emphysema it is associated with a marked degree of dyspnœa and is non productive It is paroxysmal and simulates a condition of asthma The cough of early tuberculosis is dry and non productive and the presence of expectoration suggests that ulceration of the lung has taken place When the tuberculous disease has advanced to the state of cavitation the cough becomes paroxysmal in nature and the patient attempts to empty the cavity This type of cough is also met with in advanced bronchiectasis The cough is almost incessant in cases of new growths in the lungs In the early stages it is dry and hacking and later on associated with hæmorrhagic sputum In cases of cardiac dilatation the cough is painful and entails an effort on the part of the patient The cough in cases of enlarged mediastinal glands mediastinal neoplasms and aneurysm is paroxysmal in nature nd later on it is of a mild type but irritating persistent and non productive The ue brassy cough is always a diagnostic feature of severe degrees of pressure Causes the reflex causes of cough include some local irritation in the ears or teeth disorder of the gastro-intestinal tract pericarditis and genitourinary diseases in women or after abdominal operations It is dry persistent and non productive The most important reflex cough in the adult is due to dyspepsia associated with a pharyngitis and it is typically a morning cough and is relieved by a large and copious expectoration The habit cough of heavy smokers is familiar to all The nervous cough is usually of a barking nature and is more distressing to others than to the patient It is non productive and is generally associated with nervous diseases The hysterical cough is still more harassing and may be associated with hæmoptysis

A thorough investigation into the personal and family history of the patient with a careful physical examination of the chest considerably helps the diagnosis Skiagrams of the chest often detect hidden lesions A local examination of the oral cavity throat and the accessible portions of the pharynx and larynx should be made before the treatment is adopted

TREATMENT A correct diagnosis of the primary cause should always be imed at for successful treatment The indiscriminate use of anti-cough remedies ay mask the true cause of the malady which if early detected would have elded a better result from the treatment The treatment is both med cal and rgical The enlarged tonsils uvula and adenoids should be removed under strict gical asepsis In pharyngitis secondary to dyspeptic conditions a correction Treatment diet and avo dance of alcohol and tobacco in excess will do much more than the nary cough mixture Rest in the recumbent position fresh air restriction xercise and avoidance of fatigue should form the fundamentals of

Warming of the bed in cold weather is of particular value in children In the acute catarrhal stage diet should always be liquid and warm feeds are better tolerated Milk, barley fruit juices and foods rich in vitamin A should be given. Heavy meals should never be allowed to patients with chronic cough as these add to the distress of the patient during attacks of coughing

Drugs In selecting and prescribing proper expectorant drugs the stage of the disease should be recognised The drugs are classified as *sedatives stimulants* and anodynes The sedatives are useful in the acute inflammatory stage of the disease while the anodynes are of particular value in incessant cough which is *ameliorated by the drugs* Sulphate of codeine (¼ gr) allays irritable cough from reflex causes In combination with sedative expectorants it is useful in excessive dry cough Ammonium salts such as the chlorides and the carbonates increase the secretion of bronchial mucus Terpene hydrate (3 to 5 gr) lessens cough associted with excessive recretion Tincture of belladonna and sulphate of atropine are useful drugs in whooping cough Iodide of potassium (5 to 15 gr) though a useful expectorant should be prescribed with caution bromides lessen [illegible] hooping cough and hysteric cough As cough *onstitutional disease measures to promote* Sometimes surgical measures to eradicate tonsils or adenoid growths are of benefit

The following mixture is useful to lessen the congestion of the inflamed mucosa in larygitis and tracheitis Bicarbonate of sodium 15 gr tincture of ipecacuanha 8 min syrups of tolu and squill each ½ dr spirit of chloroform 10 min and infusion of senega to 1 oz on free In these cases compound *water to which 3 min each o* serves as a useful inhalation the cough of laryngitis and tr early stages of bronchitis when the cough is painful and non productive Wine of antimony 15 min chloride of ammonia 10 gr spirit of chloroform 10 min syrup of orange 40 min camphor water to 1 ounce The mixture should be discontinued as soon as the sputum becomes free The following alternative mixtures are helpful in the later stages of bronchitis when expectoration is copious (1) Carbonate of ammonia 5 gr tincture of nux vomica 8 min tincture of squill 15 min and water to 1 oz (2) Carbonate of ammonia 5 gr tincture of squill 15 min compound tincture of opium and camphor 20 min and infusion of senega to 1 oz *The above mixtures are of the stimulating expectorant type* The following mixture is useful for children suffering from cough and where the expectoration is just beginning Tincture of ipecacuanha 2 min compound tincture of opium and camphor 5 min nitrate of potassium 2 gr honey *30 min* and water to 2 dr The sedative drugs prescribed for the dry cough *preventing* sleep in tuberculosis cases are codeine ¼ gr doses in form of a mixture with dilute sulphuric acid 2 min glycerine 10 min and Syrup of Tolu 1 dr Belladonna is invaluable in coughs where an antispasmodic effect is desired The followin *is a useful prescription* Tincture of sumbul 15 min tincture of stramoni 10 min tincture of belladonna 5 min spirit of chloroform 15 min water to ½ oz

[illegible] *the throat including the tonsils are* (1) Iodine [illegible] acid 3 min glycerine up to 1 oz. (2 [illegible] glycerine up to 1 oz These are useful for chronic pharyngitis The paints are to be applied morning *and evening* daily with a sterile cotton wool swab

Inhalations Menthol ½ dr camphor ½ dr, compound tincture of benzoin up to 1½ oz A teaspoonful of this mixture is added to a pint of hot steaming water and the vapour arising out of this is inhaled by the patient A few drops of compound tincture of benzoin only may be added to hot water and the vapour inhaled The drugs lubricate the respiratory passages and facilitate expectoration

Sprays Camphor 1 gr oil of eucalyptus and peppermint each 4 dr paroleine up to 4 oz The mixture is used in a DeVilbiss spray for the nose and throat

23. Cramps

These are painful spasms of the voluntary muscles resulting in temporary loss of function of the part affected In most cases it is suggested that the condition is due to a deficient supply of blood which is not in keeping with the amount of work performed by the affected muscle Such an explanation is applicable to cases such as intermittent claudication or angina cruris where a spasm of the vessel wall precedes the cramps The group of muscles affected presents signs of exhaustion and various factors are held to predispose to it Overwork cold unfavourable environment etc are a few of the many predisposing causes Compression of nerves is held to be an exciting cause in cases of cramp such as follows from sitting on the hard sharp edge of a chair badly fitting splints and the use of crutches A very painful form affecting often the abdominal muscles and lasting for a prolonged period is met with in individuals working in foundries amidst high temperature In cases where body fluid is enormously drained out as in cholera and severe diarrhoeas cramps are attributed to defective circulation consequent upon the enhanced viscosity of the blood Other common causes of cramp include chronic gout chronic interstitial nephritis anaemia Raynaud's diseases tetany tetanus strychnine poisoning ergotism and the paraplegias Cramp is very often met with in occupational neuroses where there is a disturbance of motor function and is particularly seen when some movements are attempted by individuals in the course of their occupations It is generally associated with neurasthenia though actual neuritis arterio sclerosis of the vasa vasorum etc are met with in many cases which distinguish them from idiopathic occupation neuroses The common forms are those of writers telegraphists violinists typists pianists cigarette-markers etc It is also seen in the leg muscles of turners and lathe-workers and in the face muscles of players on wind instruments glass blowers etc

TREATMENT The treatment of cases should aim at treating the primary causes Rest hot applications and baths suitable massage and exercises are effective measures in the treatment Antipyrin 10 gr on retiring is often efficacious in troublesome cases In occupational neuroses prolonged rest of the part is imperative and later on new method of carrying on such occupations should be cultivated Drugs are of little value in these cases and local treatment to the fore arm and hand is often effective Electrotherapy in the form of galvanic baths or galvano faradism is often recommended Hydrotherapy and other general measures should be adopted in neurasthenic cases Saline infusion is of particular value in all cases of cramps and has been very lately advocated

4 Dengue See page 906

5 Diabetes. See page 162

Diarrhoea

It is a very common complaint in the tropics It should be regarded as a symptom not as a separate disease The general causes of diarrhoea

factors which increase the fluid content of the fæces It may be produced by (*a*) rapid passage of intestinal contents through the large intestine before the absorption of the fluid has been completed, or (*b*) by an excessive secretion of the lining membrance of the intestinal tract or (*c*) both factors combined, because generally what causes increased peristalsis also stimulates secretion

The individual causes of diarrhœa are —(1) Dietetic errors Ingestion of large quantities of food or fluid may produce diarrhœa from the (*i*) stimulus due to bulk, (*ii*) increase of fluid content of the gut, (*iii*) defective digestion (*iv*) excessive fermentation and (*v*) irritation

The inhabitants of the tropics, especially the new comers, are especially prone to take more of spiced food with the result that their livers are continually over stimulated producing *tropical liver*, which is characterized by attacks of hepatic congestion and hepatitis Unsuitable food is a very frequent cause of diarrhœa in children *Milk is often a source of illness,* as its supply is not always satisfactory Too much over ripe fruit or rich foods cause intestinal disturbance (2) Specific organisms—dysentery organisms are frequently associated with tropical diarrhœas The attacks usually alternate *between dysentery relapses Alternate constipation and diarrhœa is a common* manifestation of chronic amœbiasis Chronic Flexner infection often gives rise to protracted diarrhœa *Bact pseudocarolinus*, a mutated Flexner type (phage modified) is another cause, organisms of the Morgan group also cause severe diarrhœa, *Ps pyocyaneus Bact fæcalis alkaligenes* and *B proteus* and certain types of streptococci may produce similar symptoms

Outbreaks of diarrhœa due to food poisoning are not uncommon tinned meats and rotten flesh or fish cause diarrhœa Gærtner s bacillus being the organism commonly found Certain helminths especially schistosomidæ cause intestinal irritation and diarrhœa (3) Chemicals or mechanical irritants *e g*, salts arsenic arsenic certain waters (they contain salts and suspended particles of clay mica vegetable debris or some organic matter) (4) Diarrhœa associated with other diseases *e g*, intestinal disturbances are common in typhoid undulant fever kala azar relapsing fever and malaria tuberculosis of the intestines and malignancy of the rectum cause diarrhœa (5) Diarrhœa of unknown causation *e g*, *spruc* and hill diarrhœa are tropical affections of this nature See page 879

[illegible]

[illegible]

thin and atrophic and the patient becomes emaciated and anæmic

Symptoms depend on the cause of irritation and the part of the bowel involved If the upper part of the small intestine only is affected the diarrhœa is not so watery but motions contain undigested food If the large intestine is affected there is excessive mucus The stools are greenish when bile is passed out unaltered They are pale or white if diarrhœa is due to derangement of the liver If [illegible] ith gas formation stools become frothy and acid [illegible] anus if the stools are very irritating In acute c[illegible] the abdomen may be troublesome the patient becomes prostrated from dehydration and toxæmia Asthenia anæmia emaciation œdema of the feet, purpuric spots are met with in chronic cases

DIAGNOSIS It depends on the cause (1) Repeated examinations of stools macroscopic, microscopic and bacteriological are very important (2) Blood examinations especially in the early stages are advisable (3) Agglutination of the blood against dysentery bacilli may be positive (4) Wasserman's reaction if syphilis is suspected (5) Rectal examination (ulcer stricture new growth) should never be missed in a chronic case (6) Sigmoidoscopy should be done (7) Barium meal and barium enema may give very useful information

TREATMENT (1) Rest in bed if the attack is severe (2) Diet No food for the first 12 hours, afterwards give albumin water barley water, rice water (4 oz every 2 hours) later milk arrowroot sago and rice may be given As recovery takes place give fish and eggs meat and vegetables should be withheld *Treatment* until all traces of irritation have disappeared In infants if breast fed and the

sour milk In chronic cases give raw meat juice in teaspoonful doses preparations of dried milk may be tried (3) Drugs (i) A preliminary purge *viz* castor oil or fractional doses of calomel followed by salts are helpful in early stages, (ii) later bismuth salicylas 10 gr with Dover's powder 5 gr or chalk mixture or

Prophylaxis (1) Food should be fresh and well cooked and without any irritants (2) Milk and water should be pure (3) Overfeeding and excesses are to be avoided (4) Regular action of bowels and exercises are important (5) Avoid chill and exposure to the sun (6) Supervision of kitchen and servants is essential

27. Diets and Dietetics See page 77

DIET IN DIARRHOEA In acute diarrhœa nothing but plain water or barley water is given for a day or so When the symptoms have somewhat abated *Diet in Diarrhoea* weak decoctions of cereal preparations *viz* arrowroot sago *chira* are given Milk is gradually added and then other non irritating preparations

In cases of chronic diarrhœa diet depends on the cause If it is due to carbohydrate fermentation (acid stools) milk casein preparations soup fish and meat (specially underdone) suit best If on the other hand there is protein decomposition (alkaline offensive stools) the diet should consist of carbohydrates If the stools are white greasy and show fat droplets fat should be withheld from the diet

DIET IN DYSENTERY Diet in infections with *B Flexner* *For Europeans* Albumin water whey milk (citrated or uncitrated) starchfree prepared milk *Diet in Dysentery* food like Allenbury's No 1 Glaxo etc soup boiled fish lightly boiled or poached eggs minced chicken *Vita weat* biscuit etc *For Indians* Indians depend

Articles of diet commonly used but contra-indicated Barly, arrowroot, sago, rice and sugar Ordinary biscuits and bread are also unsuitable

DIET IN INFECTIONS WITH B SHIGA, B STRONG, AND IN CHOLERA Starchy protein free diet, such as barley water, arrowroot water, sago and glucose water

DIET IN TYPHOID FEVER. In the acute stage 1½ seers of milk is given daily, diluted with barley water or lime water in measured quantities at 2 or 3 hourly intervals The nutrition value is increased by the addition of glucose lactose, plasmon cream, Horlick's, etc, to the milk Tea and coffee may be allowed in moderation and the monotony of the diet varied by the addition of soup, broths and orange juice Plenty of cold plain water is given in between the feeds Should intestinal discomfort occur or curds appear in the stools milk is citrated or peptonized Milk is substituted by whey and albumin water if there is much diarrhœa or tympanitis Such things as lightly cooked eggs custards, bread crumbs and milk, etc, may be given if liked by the patient, in the absence of much toxæmia and complications

DIET IN CHRONIC INTESTINAL STASIS A bulky diet that leaves a large amount of residue is recommended It includes oatmeal, green vegetables, wholemeal bread fruits (especially prunes, figs, apples, bael), etc Fats and oils are also increased in the diet A glass of cold water should be taken early in the morning on rising

MODIFIED *SIPPY DIET* The aim is to keep the stomach free from active
hydroch ... ty of fat in the form
of crea ... ine before the feeds
Three c ... e citrated are given
every h ... or three days first
in the ... d farinaceous foods
are gra ... *The amount given*
in each ... each feed a powder
contain ... , is given alternately
with a ... iate 10 gr Half an
ounce of olive oil is given ... feeds and atropine 1/100 gr, or tincture belladonna 5 min immediately before the other feeds The amounts of magnesia *and bismuth may be so regulated that neither constipation* nor diarrhœa results Double and triple carbonate powders may be used alteranately for this purpose, calcium carbonate being preferred to sodium bicarbo nate as the former does not produce an increased secretion of acid in the stomach

The after treatment of gastric and duodenal ulceration is important, and certain guiding principles can be laid down

1 Regular habits should be formed, meals should be small and the interval between them short (not more than 3 hours)

2 The teeth should be put in order and regular visits paid to the dentist ... well masticated

... taken between meals

... custards jellies cereals vegetables bread

... d biscuits Take meat once a day in small amounts but avoid tough meat, high game, bacon and pork A little light wine may be taken with food, salt should not be taken in excess Smoke only in moderation and not before meals Take the powders thrice daily and once in the night if awake

5 Avoid highly seasoned food cooked cheese lemon juice marmalade, pickles, spices, vinegar, acid fruits strong tea coffee or cocoa, rough foods very hot food especially meat soups and any alcohol on an empty stomach Starchy articles of diet that have been cooked in fat, *e g*, fried potatoes and fried bread, should be avoided

6 Regular action of the bowels is essential

KETOGENIC DIET It has very recently been introduced in medicine as a therapeutic measure in many diseases It has been used with favourable results in chronic urinary infections epilepsy, and migraine The presence of ketone bodies in the urine has an inhibitory action on bacterial growth The ketogenic diet contains a preponderance of fats over carbohydrates and proteins When it is necessary to continue this dietary regime for a long time it is of paramount importance that the patient should receive an adequate amount of protein, vitamins and minerals in order to avoid a dietary deficiency syndrome The proportion of fat to carbohydrate and protein combined is 2 to 1 or even 3 to 1 Such a *Ketogenic di*

[illegible]

The effective bacteriostatic factor in the urine of patients on ketogenic diet is β hydroxybutyric acid Fuller has also shown that aceto acetic acid and acetone have slight bacteriostatic power Mandelic acid a hydroxy acid is excreted completely unchanged in urine after oral administration and has been used in recent years to replace t' [illegible]
to give 12 gm of mand [illegible]
limited to 2 pints As [illegible]

INVALID FOOD PREPARATION (1) *Barley water* Take 2 oz of pearl barley and wash it well with cold water Put it up in a saucepan with 1½ pint of water and simmer for about half an hour Strain sweeten with sugar and a few drops of lemon juice and serve *Invalid food*

(2) *'Chira gruel* A tablespoonful of fresh *chira* (pounded rice) well washed with cold water is made to simmer in a saucepan with a pint of water for 15 to 20 minutes and then strained It is now flavoured and served

(3) *Rice gruel* A tablespoonful of fine and well seasoned old rice is first washed with water and then boiled in a saucepan with one pint of water for ¾ to 1 hour This is strained and the gruel so formed is served properly flavoured This is very suitable for convalescent typhoid patients preliminary to solid food

(4) *'Sooji, gruel* One tablespoonful of *sooji* is added to ½ to 1 pint of water and is made to simmer in a saucepan till made into a rather thick gruel It is now served with sugar

(5) *Lime whey* Boil ½ pint of milk in a saucepan When it is bubbling add sour lime drop by drop till the milk curdles Strain to separate the curds and the light green transparent fluid is the whey It should not have a milky appearance and it should not be made too sour

(6) *Sherry whey* Boil ½ pint of milk in a saucepan and 2 oz of sherry and strain

(7) *Powdered milk food Plain milk powder* (Lactogen Glaxo Allenbury No 1) or the same mixed with malt (Nestle s Horlick s Allenbury No 2, Milk food) is prepared by first making a paste of the powder with cold water and

then slowly adding hot water and thoroughly mixing with a spoon The quantity of the powder required depends on the thickness of the preparation desired

(8) *Powdered food, prepared with milk* Mellin's food (malted carbohydrate) Allenbury s *malted food (mixture of wheat flour and malt)* or Sanatogen

repared by making a paste of the powder
hot milk One or two teaspoonfuls are
Ovaltine (a special variety of cocoa
containing malt and milk powder) and Vitavose (containing vitamin B maltose and dextrin) are also prepared in the same way

(9) *Peptonising milk* To $\frac{2}{3}$ pint of boiled cold milk and $\frac{1}{3}$ pint water and heat the mixture to about 140°F (just hot enough to be bearable on the skin) Into a saucepan put either two teaspoonfuls of *liquor pancreaticus and $\frac{1}{2}$ a level* teaspoonful of sodium bicarbonate or one tube of peptonising powder and make into a paste with cold water To this the warm milk is now slowly added and *thoroughly mixed This is kept covered in a warm place or in a water bath for* about 10 minutes The preparation is again brought to boiling point to stop further action of the ferment as overaction makes the preparation bitter It is now *sweetened and served Milk is often peptonised with Benger s food (containing* a mixture of wheat flour and pancreatic extract)

(10) *Junket* Take lukewarm milk add sugar to it put into a deep enamel dish and add essence of rennet or rennet powder in quantity indicated on the label Keep it undisturbed in a warm place or on a water bath for 1 to $1\frac{1}{2}$ hours when it sets Serve with sugar It is an easily digestible and palatable convalescent milk food

(11) *'Dahi'* May be prepared in the same way as above Instead of rennet *a teaspoonful of good dahi from the bazar is added to a pint of luke-warm milk* and put in a warm water bath till it sets which usually takes $1\frac{1}{2}$ to 2 hours This should be taken before it turns acid

(12) *Oatmeal porridge* Two tablespoonfuls of oatmeal and a pinch of salt are added to one pint of boiling water and slowly cooked stirring briskly This is continued for 20 to 30 minutes till it is sufficiently thick It may be cooked with milk and sugar or these may be added afterwards

(13) *Sooji porridge* It is prepared in much the same way milk and sugar *being added when the sooji is partly boiled the whole thing being then brought* to a semi solid consistency

(14) *Typhoid bread* Take the inside soft pulp of the bread and put it into boiling milk Make the whole thing into a paste by rubbing down with the back of a spoon This is strained and sweetened with sugar

(15) *Albumin water* Pour into a cup the white of a fresh egg and beat it thoroughly with a spoon and then slowly add water to make it up to 4 oz and serve adding a pinch of salt and a few drops of flavouring

(16) Egg flip Beat 1 to 2 fresh eggs in a cup and then slowly add 8 oz of warm milk and 1 to 2 teaspoonfuls of brandy Sweeten as required

(17) *Custard* Beat up 2 eggs add $\frac{1}{4}$ pint of milk sweeten and flavour to taste The preparation is now baked in a pie dish or steamed in a basin

(18) *Patent meat extracts* Bovril (beef extract) and finely powdered beef fibrin Brand s meat essences Valentine s meat juice Panopepton (beef extract with wheat) are sometimes substituted for fresh meat extracts These are prepared by adding $\frac{1}{2}$ to 1 oz of the extract to a teacupful of lukewarm water if necessary flavoured with a few drops of lemon juice These do not keep well in

hot climates specially when the container is kept open for a few days Once a tin is opened it should be used up Virol Roboleine and Marrow Malt are preparations of bone marrow with calcium egg and malt

(19) *Raw meat juice* Finely mince ½ lb of lean mutton put it in a saucepan and add 4 oz of clean cold water Allow it to stand in a cool place for an hour and then press the juice out either with a pressing machine or by squeezing through a piece of fine linen One or two ounces of it are to be taken flavoured with a few drops of lemon juice and a little pepper and salt

(20) *Raw liver juice* Prepared in the same way as raw meat juice and served fresh or a cut piece of liver is taken and gently scraped with a dinner knife The scrapings are collected in a tea cup flavoured with orange juice and served

28 Diphtheria

DIAGNOSIS. Acute inflammation of the throat with definite membranous exudate discharge from the nose especially if unilateral and blood stained croup cervical glandular enlargement moderate pyrexia and the presence at times of albuminuria are important diagnostic points Diagnosis should be aided by the bacteriological examination but the bacteriological report does not exclude the disease if no Klees Loffler bacilli (*Corynebacterium diphtheriæ*) are found and clinical cases should be treated as diphtheria without awaiting bacteriological confirmation *Diagnosis*

TREATMENT *Anti diphtheritic serum* To obtain the most successful results anti diphtheritic serum should be administered as early as possible (see page 799)

Local treatment Local applications are of minor importance and if resisted by children it is advisable not to force this treatment and thereby exhaust the patient In adults a spray of antiserum or the following lotion and hydrogen peroxide gargle will be found useful —Sodium biborate sodium bicarbonate potassium chlorate sodium chloride—each 7 gr compound tincture of lavender ½ dr and water to 1 oz

General Absolute rest in bed is of great importance In mild cases one pillow can be given but in moderately severe cases the patient should rest without a pillow in the most severe not only should the pillow be removed but the foot of the bed should be raised a few inches (not more than 6 inches) to assist the flow of blood to the vital centres in the brain As the circulation improves the patient should gradually be allowed to assume the normal recumbent position then given an extra pillow then allowed to sit up and lastly to get out of bed He must be kept in bed for 4 to 8 weeks *Diet* Fluid diet (milk barley glucose fruit juice etc) should be given during the febrile period If there is difficulty in swallowing thick Bengeds preparation may be tried Bowels are best regulated by glycerine enema or mild aperients

Treatment of complications (1) For cough give glycerine or honey to sip or compound tincture of camphor oxymel scillæ each 20 min mucilage of acacia and syrup each 1 dr (2) For the laryngeal type give steam inhalation atropine injection 1/200 gr Tracheotomy or intubation is necessary if there is obstructed breathing as shown by increasing restlessness dyspnœa suction of the chest wall and cyanosis (3) Circulatory failure in diphtheria Diphtheria is attended with a profound toxæmia The circulatory system is profoundly affected in diphtheria and from the commencement of the disease a progressive fall in blood pressure *Treatment complicati*

is marked Death takes place during the first ten days from circulatory failure The general measures in treatment include absolute rest and under no circumstances should the patient be allowed to sit up He should be given an enema at regular intervals Diet should comprise during the first week a bland fluid beef extract chicken broth Benger s food In all severe cardiac cases a nutrient enema is most beneficial As the blood pressure attains normal level the patient may be allc ... should always be ke

A ... Adrenalin is considered to be an efficient cardiac stimulant but owing to its rapid and transient action ephedrine is much more preferred in these cases for its prolonged action Antitoxin therapy can be safely carried out after a preliminary dose of ephedrine Ephedrine may be repeated every six hours but the drug does little good in moribund cases The author has tried a tincture prepared from Indian species of Ephedra containing both ephedrine and pseudo ephedrine with excellent results In an extremely low condition of the patient ephedrine may be combined with a maximum dose of pitressin the blood pressure raising element of pituitary and it should be given at six hourly intervals till the condition improves The effect of the pituitary extract is absolutely specific in cases of circulatory failure in diphtheria If the patient approaches an acute cardiac failure intramuscular injections of pituitary and camphor in oil which seem to aid the action of the heart with the foot end of the bed raised the patient kept very warm and a light linseed meal poultice applied over to cardiac region are most helpful to tide over the crisis If the patient is not vomiting a mixture containing spirit of ether spirit of chloroform aromatic spirit of ammonia in equal parts one tea spoonful being given in a little water every four hours is most useful

Other stimulants such as strychnine digitalis and atropine appear to be of little use Oxygen therapy is very useful in cases of cyanosis All severe cases should receive brandy or alcohol in some form or other and in maximum nutritional doses In case of children it is usually administered as white wine which if carefully prepared is easily taken The circulatory failure in diphtheria is due to vasodilatation weakned cardiac output from the action of the toxin on the heart muscle and damage to the arterial wall and provided that the antitoxin be given early enough the blood pressure would not fall sufficiently to cause any serious circulatory failure, but should the antitoxin be given late for any reason or should the blood pressure fall from any of the previously considered factors then the only really effective treatment is in giving the vaso-constrictors

(4) If toxæmia is severe intravenous injection of 20 gr glucose in 40 c cm of normal saline with 10 units of insulin hypodermically is of value An alkaline mixture should also be given (5) If swelling of the neck is present warm fomentations and local icthyol application are helpful (6) Serum sickness Calamine lotion or bicarbonate of soda lotion may be appl ed locally to relieve itching Adrenalin and pituitrin in doses of 0 2 cm may be injected intra muscularly Calcium may be given by mouth The bowels should be opened well (7) Paralysis The affected parts should be rested and strychnine administered followed by massage If there is regurgitation of food due to paralysis of the soft palate the patient will have to be fed by a nasal tube (8) If there is broncho pneumonia treat it in the usual way

29 **Dysentery** See page 713—736

30 **Epidemic Dropsy** Ee page 124

31 **Erysepelas** See page 1008

32 Functional Tests

RENAL FUNCTION The efficient working of the kidneys is known by the following tests (1) Detection of abnormal constituents in urine such as protein casts etc (2) Alteration of the physiological balance between the blood and urine and the demonstration of substances in altered proportions either in the blood or in the urine (3) The eliminating power of the kidney as tested after administration of —(*a*) Some natural substances such as water urea test meals, (*b*) some foreign substances such as dyes like phenolsulphone-phthalein or indigocarmine

Renal Func Tests

I DETECTION OF ABNORMAL CONSTITUENTS OF URINE BY CHEMICAL TEST *Proteins* (*a*) *albumin* (*b*) *globulin* It has been found that the albumin globulin ratio is usually found to be above 10 in cases of nephrosis and between 5 and 10 in acute nephritis The ratio is low during the early stages of acute nephritis and it rises as recovery takes place A ratio of below 5 indicates an advanced state of glomerulo-nephritis with urea retention and impaired renal function Lawson found that a just perceptible trace by the boiling test corresponds to 0 1 gm per litre a distinct cloud corresponds to 0 5 gm per litre and a heavy cloud indicates 2 0 gm per litre or over The presence of casts blood, pus etc, signifies a renal lesion

II ALTERATION OF PHYSIOLOGICAL BALANCE BETWEEN THE BLOOD AND URINE.

The blood urea clearance test It is claimed to be the most sensitive test of renal efficiency at present available When urine volume is large the rate of urea excretion is directly proportional to the blood urea content Expressed in other words the urea excre

Blood urea clearance te

volume of the blood this

ratio between the blood ur

the urine volume is about

falls below this limit the urea excretion also falls and on the average in proportion to the square root of the volume These data led to the development of the urea clearance test Two modes of clearance are recognised The maximum clearance occurs when the flow of urine is above 2 c cm per minute and the standard clearance when the flow is below 2 c. cm per minute These two being calculated the normal percentage is also determined

No special precaution is necessary the test being performed between breakfast and lunch The patient is put to bed a glass of water is given at the beginning of the test (1) Blood for urea estimation is drawn a few minutes before the end of the first hour (2) The total volume of urine secreted is accurately measured The urine is collected at the end of one hour and again at the end of two hours and the concentration of urea is determined The standard or the maximum clearance is then calculated in each hourly specimen The normal range is from about 70 per cent upwards In terminal stages of hæmorrhagic nephr... th

20 per cent of the normal Uræmia is ...

...ce falls below 5 per cent and is uniformly

...t In some cases of nephritis values between

...a normal blood

ting the superiority of

Urea and non pr...

authorities to yield the

as in the azotæmic type in prolonged vomiting intestinal obstruction and acute abdominal lesion there is an increase in the non protein nitrogen content of over 40 mgm per 100 c cm of blood A creatinin content constantly over

Urea N

1 5 mgm per 100 c cm of blood indicates permanent renal damage With nitrogen retention, in cases of acute nephritis, the blood calcium falls as low as 6 mgm per 100 c cm of blood or sometimes lower and the phosphorus content rises to 5 mgm per 100 c cm of blood Marked nitrogen retention occurs in chronic interstitial nephritis and little or no retention is found in chronic nephritis with œdema and lipoid nephrosis Blood cholesterol is markedly increased (as much as 0 3 per cent or over) in lipoid nephrosis and other conditions such as cholelithiasis.

In chronic nephritis with œdema and in lipoid nephrosis, the albumin falls to 2 5 per cent, globulin to 1.7 per cent and the total protein to 4 per cent

Volume and specific gravity The normal urine volume is 1 500 c. cm, Sp Gr 1 015 to 1,025 In acute nephritis the volume is 200 to 500 c cm, Sp Gr 1,025 to 1,035 In chronic interstitial nephritis the volume is 2 000 c cm or over, Sp Gr 1,005 to 1,012 In lipoid nephrosis the volume is 600 to 900 c cm Sp Gr 1,020 to 1,025

III TESTS DEPENDING ON THE ELIMINATION OF SOMI SUBSTANCE ADMINISTERED TO THE BODY

1 *Water test* (Straus Graunwald method) A pint of water is given to a starving patient and urine is collected at hourly intervals Normally, the sum of the first three hours' specimen should be equal to the quantity of fluid administered, but if the quantity is less, it signifies a renal lesion

2 *MacLean's urea concentration test* Fifteen gm. of urea dissolved in about 5 oz of water flavoured with tincture of orange are given to a patient who has had nothing to drink for some hours and after emptying the bladder The urine is passed in each of the subsequent three hours and urea concentration estimated In the case of normal heal [illegible] he second and third hours is usually over 2 5 per
With moderate damage of the organs
be met with and with severe lesion under 1 5 per cent

Like all tests in which absorption of substances from the alimentary canal plays a part, it suffers from certain disadvantages The urinary excretion of urea depends in this case not only upon the concentrating power of the kidney but also upon the rate of absorption which is controlled by the emptying time of the stomach since urea is absorbed from the intestines The urea clearance test has largely replaced this urea concentration test

3 *Renal test meal* Mosenthal employs a standard diet and collects two hourly specimens of urine throughout the day The specimens are examined for volume specific gravity, urea and salt concentration The following signs indicate renal lesion (1) Fixed or low specific gravity (2) Lowered output of salts and nitrogen (3) Tendency to polyuria (4) Loss of concentration in the night urine associated with low specific gravity and nitrogen content

4 *Dye tests* (*a*) *Indigo carmine test* Ureteric catheters are introduced
[illegible] is tested in six
[illegible] how much of
This test can
Phenolsulphone
patient is given
300 c cm of water to drink and the bladder is emptied twenty minutes after and 6 mgm of the dye in 1 c cm of sterile saline are injected intramuscularly The dye generally appears in urine within ten minutes of the injection The bladder is emptied after an hour exactly and again after two hours and the two

specimens are preserved for the estimation of the dye colorimetrically in each By the first hour 50 per cent and by the second hour 70 per cent of the dye should be excreted Anything below this points to renal inefficiency By ureteric catheterisation the test can be applied to detect a lesion of each kidney separately

5 *Pyelography*

Hepatic function tests

HEPATIC FUNCTIONS (A) *Investigation of the pigmentary functions* A positive reaction of the blood to bile indicates a derangement of the hepatic function

Van den Berg reaction

Van den Bergh reaction McNee recommends the following classification of jaundice —(1) Obstructive hepatic jaundice Here bilirubin is reabsorbed into the blood and is subsequently excreted into the urine (2) Hæmolytic jaundice Here more pigments are offered than the polygonal cells of the liver can actually dispose of resulting in their transference from the Kupffer cells to the blood stream again (3) Toxic and infective hepatic jaundice This is really a combination of these two conditions An immediate direct reaction indicates obstructive jaundice a delayed direct reaction points to a hæmolytic or non-obstructive type. The biphasic reaction is seen in cases of toxic and infective jaundice The bilirubin content of normal serum is 0 2 to 0 5 units Bile does not appear in urine until 4 units are present in the blood but in hæmolytic jaundice there is no bile in the urine though 5 to 18 units are present in the blood.

(B) *Investigation of the metabolic functions* (*a*) *Nitrogen partition method* Urinary nitrogen coefficient $= \frac{\text{Urea nitrogen}}{\text{Total Nitrogen}}$ Normally the value of this coefficient is between 85 and 90 whilst in hepatic inefficiency it falls to 40 or 50 indicating a disease in the ureogenetic function The values for amino acids and the non protein nitrogen in the blood increase in such cases

Lævulose tolerance test

(*b*) *Lævulose tolerance test* By mouth 100 gm of lævulose are given and during the following twenty four hours specimens of urine are collected If lævulose appears in urine about an hour after the administration of the sugar there is hepatic inefficiency Specimens of blood are also taken at half hour intervals and tested for sugar a rise in sugar above 140 mgm per 100 c cm of blood points to hepatic inefficiency *Galactose tolerance test* Normally the ingestion of 40 gm of galactose causes no appreciable increase of blood sugar but a hyperglycæmia is m[illegible]
cirrhosis atrophy and nec[illegible]
cases The patient is no[illegible]
50 gm of glucose (1 5 g[illegible]
400 c cm of water and flavoured with syrup of orange are given to the patient
Blood sugar per 100 c. [illegible] ned at intervals
½ 1 2 and 3 hours [illegible] 50 to 120 mgm
per 100 c cm of bloo[illegible] the blood sugar
rises to 130 to 180 m[illegible] figure Blood
generally returns to nc[illegible] Urine should
not give any reaction for sugar

In mild diabetic cases the resting blood sugar is higher and after the administration of glucose the content rises above the threshold value of the kidneys In renal glycosuria the blood sugar content is always below the normal level

(C) *Investigation of the hæmopoietic functions* (*a*) The coagulation time of the blood is said to be increased in hepatic derangements The fibrinogen content of the blood is decreased in hepatic inefficiency

(*b*) *Widal's test* Generally a meal is followed by leucocytosis and this reaction depends on the functional integrity of the liver In deranged hepatic functions the reaction is either a leucopænia or there is no rise in the content

(D) *Investigation of the global capacity*

Phenoltetrachlorphthalein test The dye which is obtained in ampoules is injected intravenously, 5 mgm per kilo, in about 250 to 300 c cm of normal saline Exactly after a quarter of an hour, and again at the end of one hour 5 c cm of blood is darwn out The amount of dye present in each specimen of serum is determined colorimetrically In normal persons from 2 to 6 per cent of the dye remains in the circulation after 15 minutes and nothing remains at the end of one hour In hepatic disorders there is an appreciable amount retained in the blood after one hour

(E) *Investigation of the duodenal contents* Lyon has devised a method by which the functional integrity of the biliary passages can be tested A fasting patient is made to swallow a duodenal tube and bile is aspirated at intervals before and after injecting in the tube 50 to 100 c cm of 25 per cent magnesium sulphate solution which causes the gall bladder to contract and empty itself Bacteriological and cytological examinations of the samples of bile aspirated give reliable information as to the inflammatory and infective conditions of the various parts of the biliary tract

(F) *Cholecystography*

PANCREATIC FUNCTIONS Derangement of pancreatic function is accompanied by disturbances of carbohydrate metabolism and definite alterations in the digestive and absorptive processes of the body Diminished or absent external secretion of the organ is marked by the presence of undigested protein excessive quantities of fat and free starch in the fæces Microscopical and chemical tests are resorted to to detect these substances in the fæces and to test the efficient working of the organ

Loewi's test is a clinical test to deterct a lesion of the pancreas This is due to disturbance in the normal antagonism between the suprarenals and the pancreas The disordered pancreas excites the sympatnetic and the dilatation of the pupil occurs in response to the local action of adrenalin Two drops of adrenalin chloride are instilled into the conjunctiva and dilatation of the pupil is noticed within a short time This is characteristic of a pancreatic lesion and is not seen in normal subjects

Diastase test The normal diastatic index of urine is between 6 6 and 30 A fluctuation of the figure provides a very useful guide to diagnosis Pancreatic lesions are always accompanied by an increased diastatic index of urine Acute inflammatory conditions of the organ (acute hæmorrhagic pancreatitis) show a considerable increase of the figure to 100 200 or sometimes even higher The figure may or may not be affected in chronic pancreatitis and varies between 10 to 50 In cases of neoplastic conditions of the pancreas it is 30 to 100

Besides the tests mentioned certain clinical signs and symptoms are characteristics of pancreatic lesions depending on the involvement of the anatomical structures around the organ A tumour in the head of the pancreas compresses the common bile duct and gives rise to obstructive jaundice Irritation of the adjacent solar plexus in acute pancreatitis gives rise to pain in the epigastrium and back vomiting and shock

GASTRIC FUNCTION TEST MEALS One of the methods of investigating the gastric function is by studying the response of the stomach to test meals The common ones are, one hour method (Ewald), and fractional method (Rehfuss)

One hour method test for gastric function

of the presence of (1) free HCl, (2) organic acids, *e g* lactic acid acetic acid butyric acid, (3) blood, and (4) total acidity

The composition of the gastric content after a test meal depends upon the volume and nature of fluid in the stomach at the time of giving the meal volume and nature of the meal rate of gastric secretion and its amount and lastly the condition of the pylorus All these factors vary and it is impossible to obtain anything like comparable results with this method at the end of one hour Ewald s method therefore, has now been replaced by the other method which aims at giving a true estimate of gastric function

Fractional method test for gastric function

Rehfuss method The patient is given a light supper (a glass of milk and a charcoal biscuit) the night before The following morning before any food is taken, the patient is made to swallow a Ryle's tube The tube is marked by one transverse line at 40 cm to indicate the cardiac orifice and by three transverse lines at 57 cm to indicate the pylorus The tube is swallowed till the pyloric mark almost touches the teeth, the fasting stomach contents are then aspirated through the tube with a 20 c cm record syringe till the stomach is completely emptied The quantity of the resting juice is measured and noted If the volume aspirated be less than 20 c. cm, it is likely that the total fluid has not been recovered The injection of a syringeful of air in many cases will lead to a more complete evacuation The test meal is made by boiling one ounce of oatmeal in a quart of water until the bulk is reduced to one pint The preparation is then strained and may be flavoured with little salt Immediately after emptying the stomach, one pint of the test meal is given to the patient to drink 15 c. cm specimens are aspirated every 15 minutes for 2½ hours or until nothing further can be aspirated The specimens are collected in separate clean test tubes which are duly labelled and serially numbered 1st, 2nd, 3rd etc and then all the tubes including that containing the fasting juice are sent for analysis Each specimen is examined for the presence of blood bile, mucus starch free HCl and estimation of free HCl and total acidity is carried out The emptying of the gruel meal is indicated by the absence of reaction for starch in the specimen

Fractional test meal preparation

Fractional test meal [illegible]
HCl is very [illegible]
average of a [illegible]
the test meal shows very low HCl (lower than that in resting juice) then there is a gradual increase in concentration up to the 5th or 6th specimen (1¼ to 1½ hour after meal) rarely going above 40 After this there is a gradual diminution in the HCl content This fall is frequently shown by the appearance of bile in the specimen *Total acidity* is usually 10 to 25 c cm N/10 per cent higher than the free HCl and consists mainly of organic acids such as lactic and butyric *Blood and mucus*—nil *Motility* The usual emptying time of the gruel is from 1¼ to 2½ hours

In gastro duodenal ulcer the typical climbing curve is seen The fasting stomach may contain about 30 c cm of juice, may be slightly bilestained with no food remnants or charcoal Free HCI is in high concentration Later specimens show diminution of free HCI and total acidity Afterwards both increase steadily and go considerably above normal even up to 70 or 80 on an average The bile is absent owing to absence of regurgitation, there is no blood nor mucus

In chronic cicatrising gastric ulcer with pyloric obstruction the fasting stomach may contain about 70 c cm of the fluid traces of bile and charcoal are seen from the *previous day, free HCI is moderate, but total acidity is rather high Later specimens Acidity* Free HCI climbs to a continued plateau of moderate concentration Total acid is proportionately rather high, bile is present in traces or absent in later specimens blood is absent mucus is normal *Motility* As much as 170 c cm of fluid containing much gruel may be present even 3½ hours after the meal showing obvious pyloric obstruction Ulcers in other parts of the stomach do not give such typical pictures

Duodenal ulcers may cause very little abnormality in the curve frequently however there is a high concentration of HCI with a rapid emptying time of the stomach

Carcinoma [illegible]
which is very [illegible]
charcoal are [illegible]
relatively high [illegible]
above average [illegible]
throughout bile is absent mucus is normal and blood is present The meal leaves the stomach rather rapidly

Achylia gastrica or achlorhydria Fasting stomach contains only a few c.cm of the juice a trace of bile and no free HCI The total acid is very low Later specimens show complete absence of HCI, total acidity is also very low Bile is present in later specimens mucus is absent and blood is absent The whole meal leaves the stomach very quickly *i e* in about an hour The graph *is* represented by a straight line

33 Gastric and Duodenal Ulcers

During the last twenty five years ideas on the subject of gastric and duodenal ulcerations have been radically revised mainly as a result of the progress of abdominal surgery and modern X ray methods of diagnosis Clinicians now realise how unreliable were the signs and symptoms on which they had to base [illegible] ulcer to be made in many [illegible] Ulceration is sometimes [illegible] of indigestion

The incidence of peptic ulcer under which term are included both the gastric and the duodenal forms has been recently studied in many series of cases Duodenal ulcer is very much more common than gastric ulcer and occurs more frequently in males than in females The disease may occur at any age though cases under twenty years of age are very uncommon Patients have often suffered from abdominal symptoms for many years before coming under treatment and it is therefore difficult to be certain when the disease really started

In spite of the large amount of experimental work that has been carried out in recent years on the pathology of peptic ulcer, it must be admitted that the cause of the condition is still undecided

Various factors have been thought to be responsible for the causation of the ulcer The gastric juice or perhaps its hydrochloric acid content may in some way be responsible as ulcers occur in such situations as are expossed to its action e g the stomach the first part of the duodenum and last part of the œsophagus and in the jejunum of cases where gastro-jejunostomy has been performed Interesting experimental work by Bolton confirms the fact that the acidity of gastric juice and pyloric obstruction are factors in the production of peptic ulcers

Causes of ulcers

Of recent years great stress has been laid on the importance of focal infection as a cause of peptic ulcer The experimental work of Rosenow in America lends support to this By inoculation of streptococci obtained from infected teeth of ulcer patients he claims to have produced gastric ulceration in animals Although this is not absolutely convincing it is reasonable to suppose that chronic sepsis such as may occur around the apex of a tooth or in a chronically inflamed appendix or gall bladder may play a part in the establishment of gastric or duodenal ulcer The work of Bolton has demonstrated in animals that the introduction of septic materials into the stomach is followed by the formation of ulcer Alvarez (1932) is not satisfied with any of the theories of causation of ulcer and particularly with the infection theory He suggests that the importance of psychical factors has been overlooked and that ulcer commonly appears in persons who live under nervous tension.

Sometimes the ulcer results from auto digestion of a portion of the stomach wall from which the blood supply has been cut off by a minute embolus lodging in an artery The presence of a foreign body in the stomach erosion of the gastric mucosa by strong acids and alkalies are also important ætiological factors Anæmia chlorosis chronic colitis and gastritis associated with hyperchlorhydria are important predisposing factors Besides there may be gastric ulcer diathesis as gastric ulcers tend to run in some families and duodenal ulcers in others

Ulcers may be acute or chronic and the symptoms of the two conditions are different Acute ulcers are generally multiple small and superficial Hæmorrhage is common but rarely fatal A chronic ulcer is usually single and irregular in shape with an indurated edge It is usually found near the pylorus on the lesser curvature towards the posterior surface of the stomach and the symptoms are periodic and intermittent the chief being pain vomiting and hæmatemesis The pain is characteristic its onset is most punctual in the same patient after the same meals and it appears with the most exact regularity after the same interval of comfort The periodicity of pain is altered by variation in the quantity and quality of the food and by irregularity of meals It is complained of in the epigastrium coming on within half an hour to an hour after food and relieved by vomiting The nearer the ulcer is to the pylorus the lower down is the pain and longer its interval after a meal In cases of duodenal ulcer the pain continues until food is taken to relieve the pain The definite relationship of pain to food intake has been described by Moynihan as follows In case of gastric ulcer the pain which after an interval follows the taking of a meal gradually disappears before the next meal In cases of duodenal ulcer the pain continues until the next meal or until food is taken to give ease to a wearisome pain The rhythm of gastric ulcer is 'food comfort pain comfort and then again food comfort pain comfort of duodenal ulcer it is 'food comfort pain' and then again food comfort pain a quadruple rhythm in the former disease a triple rhythm in the latter The pain may be slight or intense and may radiate to other regions of the body The actual cause of pain is uncertain Some believe it to be due to the spasm of the muscles of the stomach According to Hurst tension is the cause of pain Diffuse tenderness over the abdomen is present with a little

Acute or ch[ronic] ulcers

Causes of pain in ulc[ers]

rigidity of both the upper recti muscles An area of cutaneous hyperæthesia can be demonstrated in many cases When the pain is delayed from one to two hours after food the ulcer is probably a prepyloric one If the delay is more *than two hours the ulcer is likely to be duodenal*, it lasts till the next meal which usually gives relief for a definite period When complications such as pyloric stenosis or perigastric inflammation etc, set in the pain becomes more continuous and the regularity of its onset in relation to *food becomes lost Vomiting* directly after food is unusual in gastric ulcer It sometimes comes on shortly after taking food and a definite interval elapses which may be longer or shorter according to the position of the ulcer Hæmatemesis and tarry stools (melæna) may supervene as complications Hæmatemesis may be absent in duodenal ulcer and altered blood may be passed as tarry stools (melæna) Of the other less important symptoms secondary anæmia the feeling of a definite tumour or *thickening in the epigastrium constipation* etc deserve mention

Apart from clinical study, the following methods are available for the investigation and diagnosis of gastro-duodenal ulcers —(1) Ewald s test meal (see *page 1149)* (2) *Fractional test meal (see page 1149)* (3) *Occult* blood in fæces (4) Radiography Examination of the stomach and duodenum by means of the X rays after the ingestion of an opaque meal is very useful in the diagnosis of ulcers of these organs Investigations should be made both under the screen and with photographs The opaque meal used in the screen examination usually consists of 3 oz of barium sulphate in half to one pint of milk By this means the shape of the stomach and its filling properties can be investigated The motor activity [illegible] ter studied with a more solid meal [illegible] ng barium sulphate There should [illegible] ich after six hours Persistent deformity in the outline of the stomach or duodenum is the most reliable evidence in the X ray diagnosis of ulcer Thus in gastric ulcer the barium may be seen filling a niche in the wall of the stomach or there may be definite organic hour glass appearance In the duodenum a persistent alteration in the shape of the duodenal cap may be seen X ray examination will also reveal pyloric obstruction

Variations in tone or in position of the stomach are not diagnostic of ulceration *Subsequent examination after administration of* belladonna is of value in distinguishing between constriction of the stomach due to spasm and that due to cicatrisation

TREATMENT *The treatment of uncomplicated gastric ulcers should always* be medical Before medical treatment is started all sources of infection in body so far as practicable should be eradicated The teeth throat and naso pharyngeal *regions* should be thoroughly examined and proper treatment instituted The difficulty lies with the intra abdominal sources of infection which are not commonly discovered and the treatment is therefore greatly handicapped The general principle of treatment of all ulcer cases includes complete rest in bed careful dieting and the use of suitable antacids *In all cases the treatment is a prolonged* one and requires the patient to be in bed from four to six weeks A modified Sippy diet is advisable with an alkaline powder after feeds and olive oil belladonna or atropine before the feeds During the first two weeks feeds are given every two hours and consist of citrated milk (3 gr of sodium citrate to an ounce of milk) or peptonised milk Horlick s milk or Benger s food The quantity should be small and should not exceed five ounces The quantity and quality of the feeds are *altered and improved during the subsequent weeks* and are as follows During the third week raw eggs thin bread butter and cream

may be added to the previous diet and are given every two hours as before During the fourth week the feeds are given every two and half hours and consist of five ounces of citrated milk alternated with feeds composed of potato soup arrowroot or milk pudding During the fifth week the milk feeds are reduced and additions are made to the dietary in the form of pounded fish 2 oz lightly boiled egg and crisp toast with butter The feeds are allowed every 2½ hours The same regime is carried on up to the 8th week With these feeds measures are adopted to diminish the secretion and the strength of the resting gastric juice Immediately before the three feeds ½ an oz of olive oil is given and directly before three other feeds tincture of belladonna 5 to 10 min with chloroform water ½ oz or sulphate of atropine 1/200 gr in 1 dr of water is given to the patient

In cases of acute ulceration associated with hyperchlorhydria attempts should be made to neutralise as far as possible this acidity Alkalies should be chosen which will do this without causing a secondary secretion It has been found that sodium bicarbonate is a strong agent in producing a secondary flow of hydrochloric acid It is therefore physiologically wrong and even harmful to employ this drug in attempting to give rest to the ulcer from the effects of the acid A good

third and fourth weeks a teaspoonful of the powder is taken three times a day after feeds and two teaspoonfuls at night During the 5th to 8th weeks a tea spoonful of powder is taken twice a day after feeds and 2 teaspoonfuls at night The mouth should be well cleansed with some alkaline water after each feed During such treatment tobacco alcohol tea and coffee should never be indulged in When the radiogram indicates that the ulcer has healed after the treatment the pain and other clinical symptoms have subsided and the occult blood test (stool) is negative the patient is allowed up for gradually increasing periods and more additions are made to the dietary Besides those contained in the previous diets eggs honey apple jelly fresh fish (boiled or steamed) chicken or mutton custard pudding are added The feeds are given every 2½ hours and one teaspoonful of the alkaline powder is taken after breakfast and 2 teaspoonfuls last thing at night

meals well chewed and eaten slowly The patient should always rest for some time after meals

Rich condiments should never be added to the dietaries which should always be unstimulating so as not to invoke gastric secretion The food should be poor in protein and rich in carbohydrates and fats of sufficient caloric value and served as small feeds so as not to overdistend the stomach.

Lenhart

of eggs are reduced At first feeds are given at hourly intervals and complete rest is allowed at night Both the eggs and milk are iced and the eggs beaten up whole By the end of the fourth week the patient is put on a mixed diet containing the common foodstuffs avoiding indigestible ones While carrying out the

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comb nation consists of carbonates of calcium magnesium and bismuth each 20 gr , 1 dr of this powder in a little water is taken by the patient 1 hour after each feed during the day and two teaspoonfuls the last thing at night During the third and fourth weeks a teaspoonful of the powder is taken three times a day after feeds and two teaspoonfuls at night During the 5th to 8th weeks a tea spoonful of powder is taken twice a day after feeds and 2 teaspoonfuls at night The mouth should be well cleansed with some alkaline water after each feed

time after meals

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Sippy treatment the precipitation of alkalosis should always be borne in mind The common symptoms are headache giddiness nausea vomiting drowsiness tetany or coma, the pulse is rapid and respirations are slow Alkalies should be stopped sufficient glucose should be taken by mouth or 1 oz of glucose in 8 oz of normal saline should be administered per rectum six hourly Intravenous injections of calcium are also advocated in these cases

Protein therapy The injections of protein preparations were begun after dietetic treatment had failed The injections were made intravenously beginning with doses of from 0 2 to 0 4 c cm and gradually increasing to 1 or 2 c cm The [illegible] ed of from 4 to [illegible] sulted in some [illegible] were observed The results obtained with this form of treatment are very favourable

Indications for surgical treatment (1) If symptoms persist after prolonged medical treatment and frequent relapses occur after apparent cure as in chronic ulcers It is stated by Leube that if there be no relief of symptoms four to five weeks after medical treatment surgical aid should be sought (2) If profuse hæmatemesis sets in (3) If acute perforation with general peritonitis supervenes and the pain is persistent due to perigastric adhesions hour glass stomach stenosis of the cardiac or pyloric orifice and gastric dilatation

After treatment The patients with gastroduodenal ulcers must observe certain dietetic rules for at least six months preferably one year and some care in diet is to be taken for the rest of his life

The following rules are to be observed —

1 Avoid longer intervals than two to two and a half hours without some form of food *e g*, milk eat slowly bite and chew all the food thoroughly Try to be free from anxiety during the meals

2 Avoid highly seasoned food cooked cheese lemon juice lemon peel (marmalade), pickles spices vinegar acid fruits strong tea coffee or cocoa rough foods specially celery raisins and coarse vegetables very hot food specially meat soups fruit with pips *e g*, currants figs raisins lettuce raw apples and any alcohol on an empty stomach

3 Take specially raw or very lightly boiled eggs milk custards jellies sieved veget[illegible], plain biscuits

4 [illegible] veal lamb rab[illegible] Light wine wit[illegible]wable in moderation Smoke only in moderation and not before meals Take pulv triple carb (Maclean) one teaspoonful three times a day twenty minutes after meals and once in the night if awake

5 Avoid constipation and indiscretions in diet

34 Haemorrhage

Hæmorrhage denotes an escape of blood from the blood vessels of the body It may be arterial venous or capillary When the blood is escaping from an artery it is bright red in colour and escapes from the wounded artery in a series of jerks synchronous with the heart beats The loss of blood is considerable and rapid and the force and character of the hæmorrhage change with the fall of blood pressure In hæmorrhage from veins the blood is dark red or purple in colour

and generally escapes in a smooth even stream, uninfluenced by the heart beats In capillary hæmorrhage, there is a continuous oozing of dark bood from a cut raw surface which coming in contact with the oxygen of the air becomes bright red Hæmorrhage may be external when blood escapes from the body and internal or concealed when the bleeding is proceeding from some region of the body in which it is not often easily detected The bleeding in primary hæmorrhage occurs immediately after the division of a blood vessel in the reactionary type, the hæmorrhage recurs within 24 hours of hæmostasis while in secondary hæmorrhage generally caused by infective processes in a wound the bleeding starts after the first 24 hours usually 8 to 10 days after the infliction of the wound General constitutional symptoms after hæmorrhage are due to loss of a large amount of blood from the body Signs such as pallor loss of consciousness subnormal temperature with blanched skin shallow rapid respirations restlessness etc supervene as a result of cerebral anæmia with subsequent failure of function of the vital centres of the brain Intense thirst is complained of due to dehydration of the tissues of the body Children and old people stand loss of blood badly and regeneration is much more prolonged than that in young adults As an immediate after effect of hæmorrhage the following changes take place Th- -- ' '
within t\
loss of b

Primary hæmorrhage

... blood and this may persist for a week Within 48 hours the platelet count reaches the maximum The cell increase is more rapid than the hæmoglobin increase which accounts for the colour index being below 1 in hæmorrhagic anæmia The blood volume usually comes back to normal in six weeks but in severe hæmorrhages the recovery time is much more prolonged The specific gravity of the blood is lowered in all hæmorrhages

CLASSIFICATION OF HÆMORRHAGES *Group I* Hæmorrhages due to injuries or localised diseases such as epistaxis apoplexy œsophageal varix peptic ulcer gynæcological conditions (placenta previa postpartum hæmorrhage ectopic pregnancy, etc), hæmorrhoids and bleeding ulcerating tumours *Group II* Spontaneous hæmorrhage as a complication of a general disease This includes acute infectious diseases such as septicæmia measles small pox etc jaundice various forms of anæmia *Group III* The true hæmorrhagic diseases of the new born purpura hæmorrhagica of Werlhof or thrombocytopic purpura hæmophilia pseudohæmophilia

Causes of hæmorrhages

GENERAL LINE OF TREATMENT *Natural arrest of hæmorrhage In* hæmorrhage from the medium sized arteries the contraction and retraction of the middle and inner coats may be sufficient to stop the bleeding Sometimes a temporary arrest of hæmorrhage is brought about by the formation of clots at the mouth of the bleeding vessel Changes in the blood such as an alteration of the specific gravity an increase in the number of white cells and a fall in blood pressure associated with the shock of the injury all help in the formation of clots Ultimately a natural permanent arrest of hæmorrhage takes place by the formation of granulation tissue at the cut ends of the vessel
In all ...
of
Ho
the

Surgical hæmorrhage

to empty it partially of blood and then bandaged with an elastic bandage Other temporary measures include digital compression, ligature of the vessel where convenient compression with forceps etc The general treatment aims at promoting the rapid formation of internal clot in the bleeding vessel, procuring for the brain a sufficient amount of blood during the period of shock and supplying the necessary amount of fluid to the vascular system to maintain the blood pressure and lastly stimulating the hæmopoietic organs to replace the blood lost during

parts of the body Restlessness should be controlled with an injection of morphia ¼ gr In most cases the cause of death is the profound fall of blood pressure due to the loss of an excessive amount of blood from the body As soon as th bleeding vessel is controlled or sometimes even while doing this intravenous administration of normal saline with glucose or a transfusion of blood becomes a necessity Fluids may also be given by the oral rectal and subcutaneous routes Several pints of normal saline (1 dr NaCl to a pint) at a temperature of about 100°F must be administered per rectum till the blood pressure rises or about a pint or a half at a time may be injected subcutaneously into the loose cellular tissues under the breasts or in the flanks In the intravenous method of administration of fluids the vein usually selected for operation is the median basilic vein of the arm The fluid used is normal saline at the body temperature the quantity being 2 to 3 pints at a time for an adult patient The administration should be undertaken under strict aseptic measures For detailed technique and precautions

little use in the general treatment t given by mouth or injected in obstetrical and gynæcological 2 to 5 c cm of a 10 per cent solution is helpful in increasing the coagulability of the blood Injection of whole blood 10 to 20 c cm hæmostatic serum 2 c cm or normal horse serum 20 c cm are also effective measures

Diet has an effect on bleeding tendencies Lipins and globulins which are contained in the liver kidney brain egg a definite increase of blood clotting pow consisting of vegetables and low in food flower and stewed fruit will decrease th rich in iron are suitable for cases of secondary anæmia hæmorrhage

CAPILLARY HÆMORRHAGE Considerable blood is sometimes lost by capillary oozing *Treatment Heat* This may be applied in the form of hot water (115°F) cautery at a dull red heat etc The drawback in case of a cautery is that there is a chance of recurrence of hæmorrhage when the slough separates

Cold This is applied in the form of cold water or ice and is very effective in the treatment of hæmorrhage from the nose mouth and throat *Pressure* Well graduated pressure as by plugging a wound from the bottom is very often effective in arresting a capillary oozing Care should be taken not to devitalise a part during such a procedure *Hæmostatics* Local application of hæmostatics such as adrenalin turpentine compound tincture of benzoin perchloride of iron horse serum coagulin etc are very often effective in checking local oozing from many parts of the body Wright's styptic is an extract of the thymus or testis made with saline to which 5 per cent of calcium chloride and a trace of sodium carbonate are added with 1 per cent phenol as a preservative The

styptic is applied locally The wounds should be well dried before the application of hæmostatics

HÆMATEMESIS Vomiting of blood may be due to various causes The common sources include gastro duodenal ulcer and œsophageal varices resulting from the chronic passive congestion of the portal circulation and cirrhosis of the liver Gastrostaxis or gastric oozing from a local lesion in the stomach is also an occasional cause of profuse hæmorrhage Coffee ground vomiting is characteristic of gastric carcinoma Aneurysm of the aorta by leaking into the œsophagus may cause hæmatemesis Serious hæmatemesis may also occur in enlargement of the spleen especially in Banti s disease and thrombosis of the splenic vein Mechanical injury and corrosion of the gastric mucosa by corrosive poisons are also important causes The general toxic causes include poisons such as arsenic and phosphorus and toxins of various diseases such as acute yellow atrophy infective and toxæmic jaundice small pox malaria yellow fever hæmorrhagic disease etc A slight degree of hæmatemesis is not infrequently cyclical vomiting post anæsthetic vomit and acute intestinal obstruction The originate in the stomach itself but nay ixis a bitten tongue in epilepsy or from bleeding gums

Causes of hæmatemesis

In hæmatemesis giddiness and faintness precede the actual bringing up of blood the blood is dark in colour clotted and often mixed with food materials It is usually acid in reaction

Treatment The treatment of hæmatemesis is essentially that of its primary cause If the source of bleeding is easily detected it may be controlled under aseptic surgical measures Usually a gastro duodenal ulcer is a common cause of hæmatemesis The bleeding may be profuse and prove rapidly fatal Such a hæmorrhage may be capillary venous or arterial Medical treatment should always be tried first in case of hæmatemesis from acute gastric ulcer Absolute rest should be imperative The patient should be laid horizontally and an ice bag may be applied to the epigastrium No food or stimulant should be given by the mouth but small fragments of ice or sips of iced water may be allowed at times Morphia ¼ gr may be administered hypodermically to calm the patient and as much as 1 gr of the drug may be administered in 24 hours A rectal injection of normal sal ne (about 4 to 6 oz) containing 4 dr of glucose may serve as nutrition to the patient and may be repeated every 6 hours Hæmostatics like horse serum 10 c cm coagulin 5 c cm etc may be injected intramuscularly Intravenous injection of a 10 per cent solution of calcium chloride in 5 c cm doses is very often effective Styptics such as adrenalin chloride (1 in 1000) 10 to 15 min or turpentine oil 5 to 10 min by mouth are al o advocated in these cases When there is considerable loss of blood transfusion is of particular value

Treatment

HÆMOPTYSIS The term hæmoptys s or the spitting of blood is employed to indicate bleeding from the lungs or the respiratory passages It may be true or spurious When true the blood is derived from the larynx trachea bronchi or lungs whereas in spurious hæmoptysis the source of bleed ng is above the larynx The commonest cause of hæmoptysis is pulmonary tuberculosis It may also occur in pneumonia but the sputum is usually rusty in colour Pulmonary infarction is another cause of hæmoptysis
especially mitral valvular disease is a cause
Rarer causes of pulmonary hæmorrhage a
and neoplasm Ulcerations of the larynx i

Causes of hæmoptysis

may be spat out In bronchiectasis a brisk hæmorrhage may occur Among the rarer general causes of hæmoptysis are hæmorrhagic fevers scurvy leukæmias etc Trauma as from a fractured rib or gun shot wounds, is another cause Blood is sometimes expectorated in cases of high blood pressure, arteriosclerosis and emphysema

In hæmoptysis the blood is coughed up, it is frothy, bright red in colour and is alkaline in reaction After the actual attack the sputum is streaked with blood for days together

Treatment Absolute rest in bed in the recumbent position is imperative Food or stimulants should not be allowed Morphia ¼ gr may be injected hypodermically to calm the patient If the focus of bleeding is detected in one of the lungs an ice bag may be applied over it In such cases the patient should be inclined to that side as this will prevent the blood from being aspirated into the healthy lung If the hæmoptysis is severe the affected lung should be collapsed by an artificial pneumothorax (for details of the technique of artificial pneumothorax see page 690) Other measures such as the inhalation of amyl nitrite 5 min the injections of hæmostatic sera (Hæmoplastin) 2 c cm or the daily injection of emetine hydrochloride 1 gr intramuscularly for 5 or 6 days may also be tried to control the hæmorrhage Blood pressure should always be lowered by saline purges Cardiac depressants such as aconite are useful Intravenous injection of a 10 per cent solution of calcium chloride in 2 to 5 c cm doses is often effective in these cases Alcohol tobacco and other stimulants should be forbidden A mixture containing turpentine oil 10 min tincture of squill 10 min syrup ½ dr and cinnamon water to 1 oz one dose thrice daily is sometimes helpful A solution of congo red has been used in the treatment of hæmoptysis and is found to be a reliable hæmostatic It is given as an intravenous injection the usual adult dose is 10 min of a 1 per cent solution This is often followed by a rigor of short duration If there is recurrence of the hæmorrhage after the first dose a further 10 min dose may be given after four to six hours

35 Haemorrhoids or Piles

These constitute a varicose condition of the veins of the anal canal and the lower inch or two of the rectum Their characteristic course situation in the loose areolar tissue and dependent position at the lowest part of the portal area with absence of valves predispose to the condition and any pressure or obstruction in the portal or systemic circulation is reflected to the most dependent part where anastomosis of vessels occurs They form a series of oval purplish swellings from which blood is readily expressed on pressure and hence piles are rarely *detected on digital examination per rectum*

Clinically piles are divided into external or internal The external piles are situated at the anal margin and are covered with skin Internal piles are situated above the anal canal and form a series of purplish ovoid bulges in the lower rectum In the absence of complications piles very seldom present symptoms beyond a little pruritus some irritation and a sense of fullness at the anus

mmediately before and after defæcation Hæmorrhage, inflammation, suppuration, thrombosis, prolapse and strangulation are the common complications of piles

Treatment (1) *External piles* In all cases, the cause, if discovered, should be removed when possible The regular use of a suitable laxative may prevent the condition The anal region should always be kept clean and all sources of external irritation removed Where the piles are inflamed and thrombosed, absolute rest in bed, fomentations and warm enemata are indicated If necessary the thrombosed mass may be incised and the clot removed, thus relieving the tension

Treatment

(2) *Internal piles* As in external piles, the primary cause and all possible sources of venous congestion should be removed, the bowels should be regulated with mild aperients like confections of senna and sulphur liquid paraffin etc The anus should be washed with cold water after defæcation and it is desirable for the patient to rest for some time after the act If bleeding is severe, astringent suppositories or ointments of adrenalin, hamamelis, tannic or gallic acid should be used, for moisture and pruritus, soothing ointments or powders are indicated

Injection treatment In cases where there is no permanent prolapse of the piles, several injections of a solution of 10 per cent carbolic acid in liquor hamamelidis or of quinine and urethane into the mucous membrane of the anal [illegible]

On the other hand, operations are contraindicated when piles are secondary to some conditions that can never be cured or relieved

36. Headache

This is one of the commonest symptoms met with in medical practice, and the various conditions with which it is associated are numerous Headache may be the first symptom calling attention to the existence of grave organic disease, and the correct diagnosis of the cause of this symptom is very important Too often unfortunately, treatment of headache precedes a careful investigation as to its cause, and an increased risk may thereby be incurred by the patient through the delay in recognising the actual cause

Definition and causes of Headache

The explanation of the mode of production of the pain known as headache is not easy, as the brain substance itself is insensible to mechanical stimulation The membranes or at least the dura mater is on the other hand, sensitive, the arachnoid contains no nerves and the pia mater receives only sympathetic twigs for its blood vessels, but the dura is supplied with a large number of sensory fibre which leave the three divisions of the trigeminal nerve distant to the Gasserian ganglion and pass to the membrane as recurrent meningeal branches The most important of these are the anterior and posterior ethmoidal and the tentorial nerves from the opthalmic division and the recurrent branch from the mandibular division that re-enters the skull through the foramen spinosum A recurrent branch from each vagus also contributes to the supply of the dura of the posterior fossa

There can be no doubt that these dural branches are concerned in the production of headaches as after the extirpation or injury after herpes of the Gasserian ganglion the headaches rarely or never occur on the same side of the head It might be assumed that all headaches are not due to irritation of the dural nerves,

but it is obvious that pain can be felt only through the mediation of the nerves and these are the only sensory filaments that are distributed to the intracranial cavity The dural nerves may be stimulated in many different ways —(1) By a rise of pressure within the skull *e g* by cerebral tumours and abscesses meningitis and congestion of the cerebral vessels (2) By poisons and toxins *circulating in the blood e g* alcohol nicotine toxins of the infectious fevers nephritis etc (3) It may
pain may be referred to a
a *state of abnormal excital*
which the visceral afferent f
in the distribution of the trigeminal nerve may excite pain that is referred to the head Similar are the *headaches of eye strain* and that *associated with diseases* of the nose and accessory sinuses Head has also shown that local headaches may be the result of pain referred from one of the thoracic or abdominal viscera due to the close central connection of the afferent fibres of the vagus with the central root of the trigeminal

The following points are to be noted whilst investigating a case of headache (1) Its position whether general or circumscribed the position of greatest intensity and whether it is superficial or deep in the head (2) The time of the day in which it occurs or becomes more severe whether it is constant or variable and if it is liable to occur at more or less regular intervals (3) The nature of the pain whether it is a feeling of a pressure or a deep boring pain a constant dull aching or a throbbing pain an intermittent shooting pain or a feeling of the bursting of the head (4) Exciting or aggravating causes what it is that starts the headache and whether it becomes worse on lying down or walking about when quiet or under excitement and if food exposure to cold worry or work has any influence on it (5) Conditions associated with the headache should be carefully investigated as they frequently throw light on its origin *e g* presence of vomiting or gastric disturbances vasomotor or cardiac symptoms the mental state during the attack if the scalp becomes tender during or after the headache or whether it is accompanied by vertigo or ocular symptoms

Though it might not be possible to include all the headaches in the categories suggested the following classifications will be of practical value

MIGRAINE Most of the familial and constitutional headaches are migranous

HEADACHES FROM RAISED INTRACRANIAL PRESSURE The most important causes are tumours and abscesses of the brain meningitis and cerebral syphilis Headache is not infrequently due to high blood pressure especially when associated with arteriosclerosis

f The headache associated with cerebral tumour is generally described as a dull deep seated pain sometimes the patient gets an intense throbbing pain or a feeling that the skull would burst open from its severity As a rule it is general but is often most severe in the frontal region or behind the eyes occasionally it is worse in the occipital region especially when the tumour lies in the posterior fossa and then the pain frequently radiates down the back of the neck The pain is more or less constant though severe exacerbations may
ebral for considerable periods An important feature
at night If the intracranial pressure be very
iated with severer bouts of pain The presence
progressive cerebral disease are important signs

in diagnosis

In acute meningitis the headache is usually general but more intense in the occipital region It is accompanied by stiffness of the neck and is aggravated by every movement of the head on the vertebral column and by pressure on the suboccipital region as these increase intracranial tension by compressing the distended posterior arachnoid cistern *Due to Meningitis*

Headache due to syphilitic involvement of the brain may either occur soon after infection or be associated with the later manifestation of the disease In early syphilis the pain is more or less constant and spreads from the occiput to the vertex or forehead and is particularly severe when the patient lies down or lowers his head It may be a result reaching the brain as the infection becomes generalised but is more probably caused by the early vascular and meningeal changes that often occur at this stage Headache in the later stages of syphilis may be due to meningitis infiltrations or cerebral vascular disease Cerebral vascular diseases and arterial hypertension often give rise to headache The arterio sclerotic variety occurs in the fifth and sixth decades of life in men more frequently than in women and usually on those who have led active and vigorous lives It is associated with premature senility mental deterioration and vertigo, and frequently insomnia or disturbed sleep at night with drowsiness during th day The headache that is increased by mental and physical exertion by worry and by bad ventilation is generally constant but never severe The state of the retinal vessels by ophthalmoscopy gives valuable confirmatory evidence regarding the state of the vessels of the brain *Syphilitic*

Treatment The treatment should be directed towards the removal or alleviation of the cause In cerebral arteriosclerosis the patient s mode of life must be carefully regulated diet should be light constipation avoided and alcohol limited or prohibited The patient is always invariably better in the open air and country life is consequently advisable A moderate amount of regulated exercise is usually advantageous Iodide with bromides are usually the most effective drugs nitrites in alkaline mixture are also frequently of value

VASOMOTOR HEADACHES Vaso motor disturbances are frequently assumed to be causes of headache There is some evidence that migraine is due to a periodic vasomotor upset and headaches associated with disorders of the ductless glands and with certain physiological processes such as menstruation may be of this nature Headache following prolonged physical and mental work and epileptic seizures are probably due to disturbances of the cerebral circulation Another common cause of headache of this nature is paroxysmal cough which raises the venous pressure producing venous congestion of the brain The distressing headaches that sometimes occur in phthisis bronchitis and asthma are directly due to this cause A rare variety of sudden onset occurring in persons subject to angioneurotic œdema is probably due to patches of œdematous infiltration of the brain and meninges *Migraine* *Physical and mental wo*

Treatment The treatment of headaches due to circulatory disturbances is usually *easy and effective Cough must be checked by appropriate means and* overexertion must be avoided where this is the cause When true vasomotor disturbances are responsible preparations of the ductless glands should be tried Belladonna combined with bromides are also of value

TOXIC HEADACHES These may be due to exogenous poisons such as alcohol nicotine carbon monoxide and lead or to toxins manufactured within the body those developed in the specific fevers pneumonia influenza and those produced by gastro intestinal disorders and in nephritis The headaches that are so common *Toxic headach*

in cholorosis are also of toxic origin In fact most poisons circulating in the blood cause headache probably by their irritant action on the meningeal nerves

The character and the situation of the pain depend upon the severity and nature of the intoxication It is usually vertical or diffuse and of an intense *bursting* or boring character in acute infections and a more or less constant dull aching in chronic poisoning

Treatment In acute intoxications *treatment can be rarely more than symptomatic* Rest preferably in a dark room with cold application to the head and forehead and the administration of such drugs as antipyrin phenacetin caffeine and aspirin generally *give some relief In the more chronic cases one should* always try to remove the cause The importance of gastro intestinal intoxication must never be forgotten occasionally a purgative alone is sufficient but more radical and systematic *treatment is usually required The regulation of the diet* and the use of liquid paraffin are usually effective remedies

REFERRED HEADACHES Defective eyes are certainly the most important source of this form of headache The pain is usually bilateral and either frontal or temporal It is seldom present or severe in the morning Diseases of the ear especially when the middle ear is involved often give rise to pain which almost always spreads to the parietal and vertical regions and is often accompanied by tenderness on the scalp Referred headaches of nasal origin are most commonly due to hypertrophy of the turbinates or deviation of the septum so that they press against one another But headaches may also result from the absorption of toxic products when drainage is imperfect and from inflammatory diseases of the nasal sinuses

Treatment The treatment consists in treating the primary causes only

37 Heat stroke (See page 72)

This appears to be due to an auto intoxication caused by lack of escape of heat from the body owing to insufficient evaporation from the skin and to the *effects of muscular fatigue As a result toxic substances accumulate* which have a selective action on the nerve cells There is also deficient oxygenation of the blood Some believe the condition to be a tissue acidosis there being a retention of carbonic and lactic acids and a consequent depleting of the blood of its alkali content In any case there can be no doubt that high relative humidity of the air is a very potent factor in producing attacks of heat stroke and prostration as it notably checks cutaneous evaporation Alcoholism is one of the chief predisposing causes The milder forms are known as heat exhaustion and heat prostration the severe from is sometimes associated with and so far as pathology *is concerned may indeed* be identical with sun stroke in which there is a direct action of the solar rays

Heat stroke proper is a much more serious matter and two clinical types may be differentiated (1) thermic fever (2) heat cramp An early warning sign in heat stroke is a desire for frequent micturition and other prodromata are dryness of the skin drowsiness vertigo headache and intolerance of light The pulse is quick rapidly becoming irregular the skin is hot and dry and the temperature elevated Delirium coma or convulsions may ensue The attack may come on very suddenly Three main types have been observed —(*a*) Asphyxial where the soldier fighting against an overpowering feeling of prostration continues to march with tottering gait fixed stare contracted pupils and cyanosed face until he collapses senseless and apparently dead His breathing is in abeyance his pulse imperceptible at the wrist and his face deeply cyanosed

(b) Paralytic in which there is deep coma recurring convulsions vomiting, diarrhœa and hyperpyrexia The skin and ejecta may emit a mousy odour (c) Psychopathic which is not so deadly and in which the patient's mental balance is upset His mind may be merely confused or he may pass into a muttering delirium or become violent and excited harbour delusions which may drive him to suicide

Heat-cramp is chiefly seen amongst ships firemen in the tropics and need not be further considered here True heat stroke must not be mistaken for an attack of cerebral malaria, though it is often very difficult to distinguish between them The blood should be examined for parasites the splenic region palpated and percussed and the history if possible obtained Cerebral hæmorrhage in which the rise of temperature follows the insensibility and cerebro-spinal fever have been mistaken for heat stroke

PROPHYLAXIS Alcohol must not be taken at least during the day the skin should be kept clean the clothes should be loose and easy and the head especially the occiput and the nape of the neck well protected Dark or tinted glasses protect the eyes from glare and the action of actinic or light rays

TREATMENT The milder degrees of sun headache are benefited by doses of caffeine and antipyrin or caffeine and phenacetin For heat prostration get the patient into the shade in a cool place if possible lay him on his back loosen his clothing about the neck and massage his limbs If there is collapse give ammonia or camphor and restore his bodily heat by hot applications A warm bath may do good *Sun headach*

The special treatment for the asphyxial type of heat stroke is artificial respiration prolonged if necessary for a couple of hours The paralytic type also requires prompt and vigorous treatment The indications are to reduce the temperature to get rid of toxic substances and to prevent cardiac failure A simple means of reducing pyrexia is the cold abdominal pack Where ice can be got it must be used to bring down the temperature an iced bath or ice pack or rubbing the body with lumps of ice A handy way is to lay the patient naked on a slightly inclined stretcher pack him with ice and play a stream of iced water on his head from a distance of 15 to 20 inches This ice-cold stream must not be continued for more than one or two minutes and collapse must be guarded against Hence the rectal temperature must be taken and the cold applications stopped when the thermometer registers 102°F Thereafter wrap the patient in blankets and apply hot bottles to the trunk and limbs An ice bag may be applied to the head If perspiration sets in the prognosis is good If the temperature rises again the cold applications must be resumed Where ice cannot be got a sheet soaked in water or dilute alcohol over which a draught of air plays may be tried or cold water enemata given There seems to be an advantage in making these alkaline i e give 1½ pints of a solution containing 2 per cent sodium chloride and 2 per cent sodium bicarbonate All patients with a temperature of 103°F or over should be placed at once in a bath of water the level of which is high enough to cover the body except the head which may be supported in a hammock or sling containing ice Vigorous friction should be applied to the entire body by several persons ice added freely to the water and the rectal temperature taken every minute When the temperature falls to 102°F remove the patient from the bath and wrap in sheets or blankets proceeding as above Cardiac stimulants especially caffeine and strophanthus should be freely given A rectal enema containing 1 drachm of chloral hydrate has been found useful in quieting wildly delirious patients Scopolamine morphine and the bromides are useful in controlling restlessness and convulsions *Paralytic typ*

As there may be tissue acidosis slow intravenous transfusion of about 1¾ pints of a 1 or 2 per cent solution of sodium bicarbonate is indicated when the patient does not quickly respond to the treatment by cold Such cases tend to develop œdema of the lungs and brain hence before the transfusion venesection should be practised as this will also help to eliminate toxic products Normal saline may also be given intravenously after the bleeding Recent work shows that certain cases of severe heat stroke are markedly benefited by lumbar puncture and the withdrawal of 20 c.cm or more of cerebro-spinal fluid It is probable that this operation will be more generally practised than heretofore, especially in cases classed as true sun stroke

Stimulants are often required but strychnine is contra indicated owing to its tendency to cause convulsions When the latter occur give cautious inhalations of chloroform watching the heart Calomel and salines are indicated at a later period Treat the psychopathic form as for heat prostration and on general principles

COMPARISON OF THE ESSENTIAL FEATURES OF THE DIFFERENT DISORDERS DUE TO HEAT

Condition	*Pathological changes*	*Clinical features*	*Treatment*
Heat cramps	Loss of sodium chloride	Cramps	Salt and water by mouth Hypotonic saline intravenously
Heat exhaustion and heat prostration	Circulatory failure from deficient blood supply	Fainting prostration, collapse skin cool and moist, blood pressure low, temperature subnormal or elevated pulse soft and small	Fluids especially normal saline intravenously General treatment for collapse
Heat hyperpyrexia	Failure of sweating	Delirium, convulsion and coma Skin dry and hot Temperature 100°F or more Pulse rapid and full	Cold water spray and fan

38 Helminthiasis See page 175

FILARIASIS *Wuchereria bancrofti infection* (see page 201) Owing to the low grade toxin of this parasite there may be no signs or symptoms in an infected individual for a long period In susceptible individuals however there may be periodical anaphylactic symptoms like urticaria headache low fever etc At [illegible] present in blood stream. [illegible] on test with *Dirofilaria*

According to t[illegible] nic area various filarial diseases develop in the infected individual *viz* elephantiasis of limbs breasts or

genitals chylocele lymph varix or chyluria Hydrocele due to filarial infection is common in endemic areas Lymphangitis of the extremities or of the abdominal region orchitis epididymitis or funiculitis recurring periodically is a common manifestation of filarial infection When the worm dies in a lymphatic vessel or gland it is eliminated by abscess formation or it may become calcified or be absorbed

Diagnosis (1) Examine the blood for microfilariæ The method of examination of blood is to take 20 drops of peripheral blood at midnight in 10 c cm of 2 per cent acetic acid solution The blood is centrifuged and the deposit examined for embryos In chyluria examine the centrifuged deposit of urine for embryos and in lymph varix or lymph scrotum examine the exudate or aspirated lymph for their presence It is a general rule that the embryos are present in the blood in the early stages of the infection before the obstruction of lymphatics is complete But in cases of chyluria they are invariably present in the blood as the block is near the juxta aortic region where owing to free anastomosis of lymphatics they are able to reach the blood circulation (2) Examine the blood for eosinophilia Moderate eosinophilia of about 5 to 15 per cent (total 500 to 1000 p per c cm eosinophiles) is seen in early cases In cases of lymphatic obstruction there may be no eosinophilia but on the other hand there may be leucocytosis of polymorphonuclear type during an acute attack (3) Complement fixation test with the *Dirofilariæ immitis* antigen A positive reaction indicates the presence of toxin of the parasite In cases of lymphatic obstruction and where the lymphangitis is due to secondary organisms the test is negative (4) Dermal test with the *Dirofilariæ immitis* antigen A positive reaction is indicative of filarial infection

TREATMENT The treatment of filarial infection therefore depends upon whether the infection is active or dead It will be possible to classify the patients as toxic or septic types by the above procedure In the case of the former preparations of arsenic or antimony give beneficial results In the case of the latter type a thorough examination of the patient with a view to detecting any focus of secondary infection has to be made The sites of secondary infections are septic gums carious teeth tonsils septic sinuses lesions or skin infections Eradicate the focus or foci, immunise the patient with auto vaccine wherever possible Stock filarial mixed vaccines consist of streptococci 100 millions and staphylococcus albus and aureus each 500 millions per c cm the dose commencing from 0 1 c cm generally increased to 1 c cm and a course of 10 or more injections has always been found to be very beneficial Mixed types need combined treatment

The routine course of treatment followed 1 *Filarial lymphangitis, lymphadenitis orchitis and funiculitis* Rest in bed calamine lotion applied locally and diaphoretics and hydrotherapy for fever For prevention of recurrence of acute attacks treat the case according to whether it is the toxic or septic type 2 *Filarial abscess* Hot boric compresses and surgical treatment by evacuation and aseptic dressings A course of autovaccine wherever possible is recommended 3 *Lymph scrotum lymph varix and hydrocele* Treatment is chiefly surgical Palliative treatment consists in the application of suspensory or pressure bandages 4 *Elephantiasis* (a) Elimination of septic focus (b) Vaccine and non specific protein therapy (c) Elastic pressure bandage (d) Surgical treatment (Kondoleon s operation etc) 5 *Chyluria* Compounds of arsenic or antimony (*e g* tryparsamide fouadin and neostibosan) have given good results in relieving this affection Since there is generally a secondary infection in cases of chyluria midstream urine or a catheter specimen culture and a course of autovaccine is

Routine treat

to be recommended Rest in bed and restriction of fats and fluids during treatment are helpful Loquid extract of Hamamelis (B P) and Liquid extract of Lodh are sometimes effective *in dram doses orally*

GUINEA WORM INFECTION *Dracunculus medinensis* (See page 206) This is very local in its incidence, the infection is endemic in several areas in North West Frontier Province the Punjab Rajputana Central Provinces Bombay and Madras Presidencies It is essentially an infection of the areas in which there is water scarcity and where the supply of water is obtained from step-wells or tanks etc The adult female usually *appears on the lower extremity* where it causes a blister, when the blister opens the uterus protrudes and discharges embryos every time it comes in contact with water The embryos develop inside the hæmocele cavity of cylops and undergo *development They become infective* in 2 to 4 weeks When the infected cyclops are swallowed by man with drinking water the hydrochloric acid in the stomach kills the cyclops but the larvæ become active and piercing the dead cyclops escape and enter the tissue They reach maturity in about one year

Anaphylactic symptoms like urticaria giddiness and vomiting etc are complained of just before the production of the blister The adult worm during its migration may die and get calcified if it is not able to reach the skin surface Such calcified worms produce rheumatic pains synovitis or periostitis when it is desirable to remove them They can be easily detected by X rays Secondary infection with streptococci or staphylococci is very common in this infection If the worm breaks in the process of extraction acute cellulitis may result due to streptococcal infection

Diagnosis Generally the diagnosis of *guinea worm infection in easy In* difficult cases the following points are of help (1) Knowledge of distribution of guinea worm infection (2) History of previous appearance of worms (3) *Moderate eosinophilia 10 to 15 per cent (1000 to 1500 per c cm)* (4) Positive complement fixation test (5) Positive dermal test with *Dirofilaria immitis* antigen

Treatment Anaphylactic symptoms are relieved by the injection of liq adrenaline hydrochloride ½ c cm intramuscularly Repeated pouring of cold water over the worm will hasten the discharge of the embryos but it takes 2 to 3 weeks to empty the worm of its embryos by this method Ethyl chloride spray hastens and empties the worm in less time Gentle traction and winding the worm on a match stick day by day is an ancient method of treatment Injections of 1 or 2 c cm of chinosol 1 in 400 or acriflavine 1 in 100 into the body of the worm or into the subcutaneous tissue *will kill the worm and it may be easily* extracted in a day or two Injection of tartar emetic intravenously reported by Macfie to kill the adult worm has not been confirmed

Prophylaxis Prevention of this infection is simple Filter drinking water *through coarse muslin Step wells and tanks are the source of infection* Surrounding the wells with a parapet and the introduction of pumps for drawing water will prevent the spread of the infection Various measures for destroying the cyclops such as heating well water by steam or the addition of caustic potash permanganate of potash or bleaching powder have been recommended but they are expensive as they would have to be done periodically

INTESTINAL WORMS (see page 195) *Diagnosis of helminth infections in stools* A supply of saturated salt solution must be prepared To be certain it is of sufficiently high specific gravity excess of salt is placed in a vessel containing water and put over the fire where *it is allowed to boil gently until a scum forms* on the surface of the water When this occurs it can be allowed to cool and it is placed in a bottle where it will last indefinitely

Take a small receptacle (a tin pill box or *dibia* is one of the best) with a capacity of about 20 c cm Place about 1 c cm of stool in the tin and add a few drops of salt solution Stir thoroughly with a glass rod or piece of stick until the stool is completely emulsified into a smooth paste This thorough breaking up of the stool is the essential step in the method if it is to be successful Add more salt solution slowly stirring meanwhile until the tin is nearly full and then add more salt solution drop by drop until the fluid is just level with the top of the tin Place a microscope slide over the top of the tin and if it has been correctly filled almost the whole of the slide within the borders of the tin is in contact with the fluid but none has run down the sides Allow this to stand for twenty minutes and lift the slide steadily taking care to keep it horizontal and then turn it over Examine with the ordinary low power and the eggs will be found floating on the surface of the fluid on the slide It is not necessary but it is preferable to use slides 2 ×3″ slides as the former completely covers the opening of the tin with a wide dry border all round and hence holds the fluid better than the narrow slide when it is being turned over The eggs found by this method are hook worm ascaris trichuris *trichostrongylus enterobius strongyloides* (occasionally) *hymenolepis nana* and *hymenolepis diminuta*

EGGS THAT FLOAT IN SATURATED SALT SOLUTION
(By salt floatation method)

	Appearance colour etc	Size	Measurement in microns
Ancylostoma duodenale, *Necator americanus*, *Ancylostoma braziliense* (hook worms)	Colourless	Medium	70-60×35-40
Ascaris lumbricoides (roundworm)	Brown knobby	Large	70-50×50-40
Trichuris trichiura (whipworm)	Dark brown knobbed at each end	Small	55 50×25 20
Trichostrongylus (similar to hook worm rare and does not cause symptoms)	Colourless	Medium	95 75×45 35
Enterobius vermicularis (threadworm)	Colourless with tadpole larva	Small	60 50×30 20
Heterodera radicicola (not true parasites accidental)	Colourless	Large	100×45
Strongyloides stercoralis (rare larvæ in stool)	Colourless	Medium	50×30
Hymenolepis nana	Colourless Onchosphere with filaments	Small	45 30 (Onchosphere 19 16)
Hymenolepis diminuta	Brownish no filament	Large	85 60 (Onchosphere 36-18)

The eggs that do not float in saturated salt solution are unfertilised ascaris *tænia saginata, tænia solium,* and all fluke eggs

EGGS THAT DO NOT FLOAT IN SATURATED SALT SOLUTION

	Appearance, colour, etc	*Size*	*Measurement in microns*
Ascaris lumbricoides (unfertilized)	Brown, knobbed Yolk granules	Large	80×40
Tænia saginata (beef tapeworm)	Dark brown 3 pairs of hooks	Small	40 30×30 20
Tænia solium (pork tapeworm)	(Indistinguishable from the last)		
All trematodes *e g Fasciolopsis buski*	Light brown with operculum	Large	140 130×85 80

TREATMENT HOOKWORM (1) *Oil of chenopodium* This form of treatment is employed when carbon tetrachloride is contraindicated One gelatine *capsule containing 10 min of oil of chenopodium is given each hour for three* doses and this is followed by a purgative two hours after the last dose (see page 232) (2) *Carbon tetrachloride* Only chemically pure samples must be used It is administered in a dose of 48 min well shaken up in 2 oz of haustus magnesium sulphate (see page 227) (3) *Oil of chenopodium and carbon tetrachloride* The combined treatment is of use because it gets rid of more hookworms than either drug alone and the oil also acts on any ascaris that may be present The dose is 15 min of oil of chenopodium and 45 min of carbon tetrachloride thoroughly shaken up in 2 oz of haustus magnesium sulphate immediately before
chlorethylene The lat
be given in doses of 1
of oil of chenopodium in the same way as carbon tetrachloride

For children In the case of oil of chenopodium 1 min for each year of age *is given up to the age of sixteen and in the case of the other drugs the usual* formula (age divided by age + 12) may be employed

ASCARIS *Santonin and oil of chenopodium In uncomplicated ascaris* infection 3 gr of santonin and 15 min of oil of chenopodium are used The oil of chenopodium is placed in a hard gelatin capsule and swallowed at the same time as the santonin with a draught of water followed in two hours by a dose of haustus magnesium sulphate (see page 198)

TAPEWORM (see page 191) The best treatment for this is carbon tetrachloride alone

THREADWORM OR OXYURIS *Enterobius vermicularis* Carbon tetrachloride in the dose employed for hookworm infection has been found to be the most effective drug The worms are difficult to eradicate and combined with drug treatment precautions should be taken to prevent reinfection by carrying eggs

from the anus to the mouth on the fingers The region of the anus should be smeared every night with dilute ammoniated mercury ointment (5 gr to 1 oz) This serves the double purpose of relieving the pruritus and killing the female worms which wander out of the anus at night Gloves which are washed every day may also be worn all night If this routine is persisted in a cure is usually effected

WHIPWORM (*Trichuris*) No cure is effective but the worms rarely cause symptoms

STRONGYLOIDES Gentian violet in doses of 1 gr three times daily for three days is sometimes efficacious

FASCIOLOPSIS BUSKI (see page 190) This is the only fluke infection in human beings in India and it is not common Carbon tetrachloride in the dose employed for hookworm is a sure cure

Other anthelmintic treatments have proved relatively ineffective in spite of the reports of their success in other parts of the world Among these may be mentioned gentian violet for strongyloides and trichuris hexylresorcinol a drug recently strongly recommended has been tried but has not been found nearly as good as existing treatments

have acted freely at least on one occasion

None of the above anthelmintic treatments should be repeated in less than ten days on account of the possibility of cumulative effects of the drugs

39 Hepatic Abscess See page 269

40 Hepatomegaly

The liver is the largest gland in the body Its normal weight varies between 45 to 60 oz It is composed of numerous lobules which may be diagrammatically

into the bile duct Between the tubular glands run the wide portal vascular capillaries passing from the portal tract to join the branch of the hepatic vein in the centre of the lobule Along the walls of these capillaries lie a number of endothelial cells known as Kupffer s cells Each portal tract contains a branch of the hepatic artery vein and biliary duct

The main funct ons of the liver may be broadly defined as arresting storing modify ng or transforming all substances brought to the liver by the portal vein The various funct ons are briefly reviewed as follows (1) Secretion of bile which helps d gestion especially of fat (2) Glycogenic function glucose is absorbed some of it is utilised at once while the excess is arrested by the liver dehydrated and converted into a colloid substance known as glycogen It can be again hydrated and changed back into glucose according to the necessity This is done by the ferment amylase which is present in normal hepatic cells (3) Protein metabolic funct on *i e* production of urea uric acid and creatinin (4) Hæmopoietic function (*a*) it acts as a storage of iron (*b*) it acts as a blood forming organ especially in fœtal life and (*c*) it manufactures fibrinogen (5) Protective function *i e*, the power of detoxicat ng the poisonous substances absorbed from the alimentary canal

Funct o is of L

Both the liver and the spleen become considerably enlarged in bacterial and protozoal infections and intoxications Various causes of hepatomegaly are malaria, kala azar, leukæmia, cirrhosis (portal and biliary), venous congestion as

and amyloid, relapsing fever, Weil's disease and trypanosomiasis

For diagnosis and treatment of the tropical conditions of hepatomegaly the reader is referred to respective sections in the book

41. Herpes. See page 1017.

42. Hiccough

This is a sudden clonic spasm of the diaphragm accompanied by a spasmodic closure of the glottis which produces the characteristic sound In most cases it *is transient and of little importance* but it is of grave prognostic importance when it sets in as a complication during the course of a disease The condition starts very early and may be seen in breast fed babies and is probably due to over distension of the stomach after feeds and swallowed air Inflammation of or ... often initiates

of the brain and encephalitis It is a common symptom in neurosis, ... epilepsy and chorea *It is commonly seen in toxic states of pregnancy such as* hyperemesis gravidarum, eclampsia, etc, and it may complicate Grave's disease or Addison's disease The condition also starts as a reflex cause in diseases of the pleura and pericardium Besides all those that have been mentioned, there are the idopathic and epidemic cases

Spidemic hiccough is a nervous form of hiccough and has been regarded as a form of encephalitis lethargica The condition may persist without intermission for several days

TREATMENT *In all cases attempts should be made to investigate and detect,* if possible, the primary causes and when found, it should be properly dealt with When hiccough persists, it is most distressing and troublesome to the patient and various measures have been tried to control it In children a spoonful of hot water, weak solution of sodium bicarbonate or dilute lemon juice may help to *control it The most frequently employed household remedies in* cases of mild attacks are pressure on the back of the neck holding the breath, swallowing a bolus of food, tickling the nose to induce sneezing gentle compression of the upper part of the thyroid cartilage traction of the tongue, sipping cold drinks and swallowing small lumps of ice A tumblerful of warm water containing *bicarbonate of sodium 20 gr, flavoured with peppermit, may* be tried in some cases Applications of stimulating nature to the epigastrium such as warmth and small mustard plasters are occasionally useful Sometimes faradism may be tried

and a tight bandage or plaster around the upper part of the abdomen may give rel ef

In intractable troublesome cases sedatives are indicated to afford rest to the patient and opiates bromides chloral hyoscine and even apomorphine may be tried in such cases Benzyl benzoate is highly spoken of in the treatment of persistent hicccough 20 to 30 drops of a 20 per cent alcoholic solution may be given with milk or water 25 to 30 min of ether injected intramuscularly has been found to give relief in a few cases *Sedatives*

Of other internal remedies nitroglycerine in doses of 1/100 gr has been found effective in some cases Oil of turpentine in doses of 10 min has been h ghly recommended by some Liquid extract of ergot in 1 dr doses frequently repeated has been very successful in some cases One minim doses of tincture of hyoscyamus repeated every half hour are said to yield good results in most cases Musk 5 to 10 gr in a pill with liquorice may also be tried *Internal rem*

Sopers advocates gastric lavage in persistent cases Lichtenstein (1928) has obta ned goo [illegible] amount of [illegible] of carbon [illegible] encouraging [illegible] mouth and [illegible] expired air the concentration of carbon dioxide in the blood is raised

In severe intractable cases of hiccough operation on the phrenic nerve has also been suggested

43 Hill Diarrhoea See page 737

44 Hoarseness

Hoarseness or alteration in the voice of an individual may be physiological or pathological The former is generally seen in subjects at puberty where a marked alteration or a sudden break in voice is noticed in the individual The pathological causes are manifold and may be met with at any period of life from the cradle to the grave It may be acute of transient duration as in simple laryngitis or it m ght t rn to a chron c form res lt ng n a permanent change the qual ty [illegible] *syph lis* [illegible] and other [illegible] of the disease should be looked for If the diagnosis is posit [illegible] Inunction with mercury is a [illegible] child is debilitate of low resis [illegible] The child is l able to pulm [illegible] kept warm A drastic antisyphilitic treatment is always indicated for the parents in such cases (2) *Papillomata of the larynx* The combined symptom of hoarseness and stridor in otherwise healthy children should arouse a strong suspicion of growths in the larynx It might encroach on the glottic area and precipitate an emergent necessity of low tracheotomy The condition is often confused with diphtheria The growths require frequent surgical removal though recurrences are common They are locally infective and hence do not permanently d sappear till a sufficient degree of immunisation is established (3) *Functional aphonia* Like the

Causes

Specific

Laryngeal Papilloma

breaking of voice at puberty in young males, this condition is most frequently met with in the female sex from puberty to the menopause This is caused by paresis of the adductor muscles of the cords It is seen in young healthy women though sometimes it follows a slight attack of tonsillitis laryngitis sudden physical or mental shock The diagnosis is easy as when such a patient is asked to cough the sound of the voice is produced in normal manner that is the adductors for the moment come into close apposition It can be cured by suggestion only The relatives of the patient are sent away and the patient is assured that she would be cured with the medicine prescribed which would strengthen the weak muscles of the sounds box As a rule definite improvement has followed such treatment Sometimes the application of a strong faradic current between the intra laryngeal electrode and the external terminal over the larynx produces the

ocal desired effect (4) *Vascular fibroma of the vocal cord* These are small peasized benign growths sessile or pedunculated found near the edge of the vocal cord They are generally seen in adult males and interfere with the production of normal voice The treatment is to remove the growth surgically and the patient is to be asked to whisper for at least a fortnight after such operation (5) *Singer's nodules* They are small white discrete projections found

les at the edges of the cord The condition is generally met with in teachers or singers who use their voices at the maximum pitch The treatment is to give a prolonged rest to the voice but the use of the galvanocautery may be necessary where the growths exceed the normal size (6) *Chronic laryngitis* Here the infection is spread from the neighbouring regions such as the nasopharynx and the accessory air sinuses It affects both the vocal cords and is seen in adults The condition flares up in the presence of constitutional diseases such as syphilis gout rheumatism diabetes albuminuria etc The treatment should be directed to improveing the neighbouring pathological condition and to curing the constitutional diseases if any (7) *Syphilitic laryngitis* This condition is generally seen in the tertiary stage of the disease Gummatous infiltration ulceration perichondritis necrosis of bone or of the cartilage are the pathological changes met with in the course of the disease Hoarseness results when the vocal cords are infiltrated or ulcerated by the breaking down of gummata The treatment includes the administration of anti syphilitic drugs to the patient (8) *Tuberculous laryngitis* It is always secondary to a primary lesion in the lungs The patient is generally young and debilitated and in addition to hoarseness of voice complains of a slight cough Clinically the lesion consists of a nodule or an ulcer affecting the vocal cord The ulcer might spread to the glottic region General anti tuberculous measures combined with prolonged vocal rest go a long way to improving the condition If the pulmonary condition improves a galvano puncture of the ulcer might facilitate a rapid healing fibrosis of the same. (9)

rynx *Cancer of the larynx* Squamous celled epithelioma is common in the larynx and is generally seen in males over forty years of age It is the intrinsic variety of the malignant growth affecting the vocal cord that causes hoarseness at a very early stage of the disease Diagnosis is made by laryngoscopy and time should never be lost till the movement of the cord is impaired during phonation Treatment of an early epitheliomatous condition of the vocal cord is more hopeful The most favoured operation is laryngofissure and its radical removal after it On the other hand the insertion of radium needles after a window resection

operation promises a better chance of recovery of voice afterwards (10) *Paralysis of cords* Besides those that have already been dealt with another causal factor of hoarseness is paralysis of one or both vocal cords due to a lesion of the recurrent laryngeal nerve Such a lesion may be both central or peripheral Paralysis of the cord of a central origin is met with in progressive bulbar paralysis basal pachymeningitis near the region of the jugular foramen syringomyelia disseminated cerebro spinal sclerosis and in tabes Radiograms often disclose factors responsible for peripheral lesions of the nerve resulting in unilateral paralysis of the cord Treatment of such a condition aims at removing the factors or treating the diseases responsible for bringing about the change in the voice. Local treatment in form of sprays paints and gargles of the neighbouring regions should also be adopted while carrying out the specific ones where needed *Paralysis of*

45 Infectious Diseases

Isolation In undertaking the care of an infectious case the physician is responsible for the treatment of the patient and the protection of the community Isolation is therefore the most obvious duty This can be most satisfactorily attained in the local hospital particularly in cases of small pox cholera cerebro spinal meningitis diphtheria etc Diseases such as measles mumps and chicken pox may be treated at home A good airy room should be chosen for the sickroom An overall apron is used by the attendants and arrangements are made for scrupulous washing of hands in some suitable antiseptic solution (mercury perchloride lotion 1 in 2000) on leaving the room Domestic utensils should be set aside for the exclusive use of the patient and thoroughly disinfected before they are taken out of the room All bed linen and clothes should be soaked in 1 in 40 solution of carbolic acid before being sent to the laundry In diseases like cholera and enteric fever the excreta should be mixed with an equal amount of 1/20 carbolic acid and allowed to stand for an hour before being thrown into the drains *General managements* *Isolation*

Nursing The patient should be sponged at least once a day the whole body being washed with soap and warm water limb by limb and dried rapidly with light friction If the temperature rises above 102 5°F an ice bag is applied to the head if it rises above 103 5°F a tepid or cold sponging may be given The back and dependent parts should be rubbed every morning and evening with a little spirit and powder Attention should be directed to the cleanliness of the mouth All decaying matter and sordes should be carefully removed from the teeth and gums and the whole mouth cavity including the tongue should be cleaned at least twice a day and in bad cases more often with a cotton wool swab This should be followed by application of boroglycerine It must be remembered also that a free supply of fluids helps to keep the mouth moist and comfortable and the patient should be encouraged to drink plenty of cold water *Nursing*

Diet A fluid diet consisting chiefly of milk is the most suitable to adopt

Medicinal treatment It depends on the nature of the disease etc and should consist of specific (if any) and symptomatic treatment

INFECTIOUS DISEASES

INCUBATION, ISOLATION AND QUARANTINE PERIODS AND DAY OF APPEARANCE OF THE RASH

Disease	Incubation period	Date of eruption	Isolation period
Cerebro-spinal fever	1 to 5 days	2nd day	Till *the naso-pharyngeal swab is negative*
Chicken pox	10 to 21 days (generally 14 days)	1st day	Till all scabs have separated
Cholera	A few hours to 6 days		Till stools are free from bacilli
Dengue	4 to 7 days	Initial erythematous on 1st day Morbili-form eruption on 4th or 5th day	
Diphtheria	2 days (1 to 5)		Until 3 consecutive culture reports are negative
Dysentery—bacillary	A few hours to 7 days		Till the stools are free from bacilli
Enteric fever	14 days (5 to 23)	7th day	Till excreta are free from bacilli
Influenza	A few hours to 3 days		For a few days after the acute symptoms have passed off
Measles ..	10 to 17 days	4th day	14 days
Mumps	to 3 weeks		3 weeks from onset of parotitis (1 week after the swelling subsides)
Plague	3 days (2 to 7)		4 weeks after the temperature is normal
Relapsing fever	5 to 10 days		Till the patient is well and deloused
Rubella (German measles)	15 to 18 days (10 to 21)	1st day	7 days from appearance of rash
Small pox	12 days (8 to 16)	3rd day	Till all scabs have separated
Typhus fever	12 days (5 to 23)	5th day	4 to 5 weeks from commencement of illness
Whooping cough	7 days (5 to 21)	..	6 weeks (till no whoop for 2 weeks)

Quarantine period is usually 2 to 3 days longer than the maximum incubation period

46 **Influenza** See page 915

47. **Insomnia** See page 55

48 **Intravenous Therapy.** See page 26

49 **Jaundice**

The word *jaundice* is derived from the old French *jaunisse*—yellow It represents a morbid condition due to increased amount of bile pigments in the plasma and tissues It is characterised by varying grades of yellowness of the skin mucous membranes conjunctiva fluids and tissues The central nervous system nerves and cartilages are the only tissues which do not absorb the pigment The substance primarily involved in the production of jaundice is bilirubin which is normally found in the blood serum and bile The yellow colour of the tissue is due to the presence of this pigment

Two methods of production of jaundice are recognised —

(a) One is primarily due to an increased amount of serum bilirubin i e bilirubin excretory s such as pernicious re there is increased ability of the liver

Causes of Jaundice

(b) The other is primarily due to discontinuity of the cells lining the bile canaliculi thereby permitting the reabsorption into the lymph vessels and capillaries of bile which has been excreted through the liver cells In this manner bilirubin bile salts and cholesterol are increased in the blood serum Associated with this there may be an increase of serum bilirubin which has not been excreted through the liver cells due to the damage done to these cells Discontinuity of the cells of the bile canaliculi is caused by biliary obstruction The back pressure and increased intrabiliary tension separate the cells and permit the absorption of bile into the lymph and blood This can also be produced by toxins or infections destroying the liver cells Such cases are associated with an increase of serum bilirubin which has not been excreted by the liver cells on account of the damage to these cells Jaundice of this character need not be associated with the absence of bile in the stool

Jaundice has been reecently classified clinically by Arnold Rich into two main types 1 *Retention jaundice* In these cases there is an excessive production of bile pigments by the reticulo-endothelial cells and diminished excretion of bile by the liver cells The latter is due to subnormal function caused by various factors such as anoxæmia febrile disease or immaturity of liver cells The excess of bile pigments enters the general circulation The causes of this group are (a) p trans of ca ing from hæmolytic septicæmias malaria blackwater fever and (d) immaturity of liver cells in the new born 2 *Regurgitation obstruction jaundice* The bilirubin in the blood is not excreted normally either owing to necrosis of the liver cells or to obstruction of bile canaliculi or ducts The ducts rupture and bile passes back into the blood channels The main causes of this group are (a) toxic agents chemical vegetable bacterial or undetermined as in cases of he biliary enlarged in which there is an excessive production of bile pigments

Retention Jaundice

Obstruction Jaundice

Rich holds that excessive production of bile pigments alone will not c jaundice An additional factor namely, derangement of the liver cells w interferes with excretion is required Totally dissimilar clinical types of jaun such as toxic processes caused by chloroform and an obstructive process du a calculus are classed together by Rich as regurgitation jaundice

n
r test

Van den Bergh s test It is often utilised to distinguish the different t of jaundice He showed that when Ehrlich s diazo reagent was added d re to normal serum no unusual colour developed When however the se proteins were precipitated by alcohol the addition of the reagent to the superna fluid produced a lilac colour (*indirect reaction*) *in a great number of cases* further showed that when bilirubin was increased in the serum this colour bec intensified He later on showed that in conditions of jaundice produced b flow of bile back into the blood stream an immediate colour reaction (d reaction) could be obtained by the addition of the reagent directly to the se without the need of previously precipitating the proteins The colour was prod by the formation of diazo bilirubinate

The explanation of the direct and indirect Van den Bergh reaction was fir given by Barron in the following manner When bilirubin in small amount taken up in a watery solution the addition of Ehrlich s diazo reagent immediately cause the formation of violet blue or pink colour depending upon acidity or alkalinity of the solution When a small amount of bilirubin is ad to normal serum the addition of Ehrlich s reagent does not produce a pro reaction If however before the addition of the reagent a small amount of surface tension reducing substance, such as bile salts cholesterol sodium ole etc is added to the treated serum the addition of Ehrlich s reagent will proc an immediate reaction The addition of the surface tension reducing substa apparently splits off the bilirubin from its protein combination and the fr pigment when brought into contact with the reagent causes a prompt posi colour reaction

Generally three types of Van den Bergh reaction are described

1 *Indirect reaction* No colour appears for at least 1 to 2 minutes a the addition of the reagent Some colour may appear after this time, but no maximum intensity The major reaction occurs only after the precipitat on serum proteins

2 *Direct reaction* The colour appears at the time of addition of reagent and reaches its maximum intensity in about 30 seconds

ne
ns

3 *Biphasic reaction* The colour appears at once at any time up to seconds after mixture of the serum and reagent The maximum intensity n occur at almost any reasonable time after this

The interpretation of these reactions is as follows

(*a*) Jaundice produced by an accumulation of bilirubin in the blood ser in those cases in which ... represen by the indirect Van de ... ser have been reported in ... 5 r It is interesting that al ... blo the kidneys are unable ... th cases

(*b*) Jaundice produced by an accumulation of bilirubin in the blood ser in those cases in which there is destruct on of bile canalicul as shown by t d rect Van den Bergh and is found (according to Barron) in association w

a substance which reduces the surface tension of the serum In these cases there is a direct passage of bile from the liver into the circulation and bilirubin, bile ... the blood serum

serum proteins because of a lack of surfacetension reducing substances

When there is necrosis of the liver cells the organ may become unable to excrete the normal amount of bilirubin Furthermore in such diseased conditions there is often an overproduction of bilirubin from an increased destruction of red blood cells and a stage is reached in which here is a marked increase in the indirect Van den Bergh reaction The liver necrosis permits passage of bile into the blood stream and direct reaction is produced When these factors are considered the biphasic reaction has real significance

There are other conditions particularly obstruction which demonstrate all these reactions During the first few days or hours after a sudden plugging of the common bile duct by a stone the serum gives an indirect reaction At this period the bile canaliculi are intact and the increased hepatic pressure causes a reflex which stops or reduces the excretory ability of the liver This is similar to an anuria due to ureteral stone As the pressure of the dammed back bile becomes greater small amounts of bile leak between the hepatic cells and into the circulation At this time a biphasic reaction is found Later on if the obstruction remains complete so much bile is thrown back upon the circulation that the reaction becomes direct This is due to much greater concentration of the unattached bilirubin As the duct dilates round the stone and bile reaches the intestine the Van den Bergh again becomes biphasic Gradully the bile canaliculi regain their continuity and only the indirect reaction persists This continues only until the excretory function of the liver returns to normal

Builirubin is found in the urine in relation to this type of jaundice When there is no discontinuity of the bile canaliculi the pigment is not found in the urine When there is sufficient liver cell destruction or intrahepatic pressure to separate the cells lining the bile canaliculi bilirubin is generally found in the urine In terms of Van den Bergh reaction there is rarely if ever a bilirubinuria in association with an indirect reaction There is however a bilirubinuria to be found in association with a direct reaction The significance of this is that the kidneys are unable to separate bilirubin from its protein conjugation but when it is lying free in the serum it is easily excreted by them

Galactose tolerance In order to assist in the differentiation of the jaundice of hep... have been brought forward The normal liver has the ... erefore it was believed that ... would be much more likely to retain its galactose consuming function than the one in which there was parenchymatous disease In the early stage of obstruction this supposition was found to be quite true but as the obstruction continued there was a greater and greater necrosis of the liver cells consequently the galactose test has in these cases, no basis to differentiate it from the cases of hepatitis *Galactose Tolerance*

50 Latent Jaundice

Latent jaundice is a term applied to conditions where the bilirubin content of the serum does not reach 4 units so that the usual symptoms are missing The hæmolytic type of this is seen in pernicious anæmia anæmias due to worms and in the new born Its occurrence is of prognostic value when salvarsan is being given as it is an evidence of the approach of poisoming by the drug An obstructive type of latent jaundice occurs in cirrhosis In this connection it is interesting to note that in the ordinary jaundice so common in the new born (icterus neonatorum) the blood serum gives an indirect Van den Bergh s re Before birth the fœtus has a polycythæm a On the second day after birth this excess will not be more than 4½ millions In a ded as a protection against the risk of loss of blood at birth jaundice may follov this view Severe pyelephlebitis from syphilis Tarely it results from congenital atresia of the bile ducts

Dissociated jaundice has been described by French observers as the b k pigments going one way the bile salts another But as they di l not take th condition of the blood into account judgment must be reserved on this There may indeed be renal dissociation in obstructive jaundice both pigments and salts being found in the blood while only bile salts are filtered out by the kidney

Urine The best test for bile pigments is Gmelin s The play of colours obtained by successive stages of oxidation with fuming nitric acid green being the most important thing to look for Rosenbach s modification of dipping filter paper into the urine and then placing a drop of nitric acid on the paper is the easiest way of performing the test The green colour given on pouring tincture of iodine on to the surface of the urine is not so sensitive a test and usually only succeeds when the jaundice is obvious Huppert s test enables us to extract bile pigment from a urine containing other pigments Ammonia and calcium chloride are added to urine and the precipitate is then boiled with alchohol acidified with sulphuric acid when an emerald green solution results

The only test of any value for bile salts in urine is Mathew Hay s test Flowers of sulphur poured on to the urine sinl if bile salts are present owing to reduction of surface tension No other test is sensitive enough to demonstrate the small quantity found in the urine but a control with normal urine makes the test more reliable

Blood It has now been conclusively demonstrated that in jaundice the b le enters the blood stream rather than the lymphatics appearing there within two ho rs after experimental ligature of the bile duct Bile salts *in vitro* have a

because hæmolysis occurs in all corpuscles acquire a heightened the intensity of the jaundice acholuric family jaundice in which the red corpuscles are unduly *frag* Occasionally small subcutaneous hæmorrhages may occur but more usually the

hæmorrhagic marks on the skin are produced by scratching excited by the pruritus or are really small telangiectases

Heart and vessels One of the most definite results of jaundice is bradycardia High tension usually accompanies a slow pulse but in the bradycardia of jaundice the pressure is low and the pulse dicrotic High tension stimulates the cardio inhibitory centre in the medulla and thus slows the heart through the vagus but bile salts have a slightly depressing effect on the heart Hence the slow pulse with low blood pressure The action can be demonstrated easily on the isolated heart of a frog As the effect can be abolished by atropine bile salts probably act through the intracardiac endings of the vagus The blood pressure is also kept low by the toxic action of bile salts on the smaller blood vessels producing some degree of vaso motor paralysis *Heart*

Central nervous system Any severe toxæmic jaundice will be accompanied by marked nervous symptoms such as headache delirium and hepatic inadequacy caused by the action of the toxins on the liver and not to the jaundice Indeed bile salts are probably not produced in this condition the liver being too damaged to elaborate them A mild degree of poisoning of the nervous system by bile salts is however common in ordinary jaundice causing headache and depression Bile pigments and bile salts are generally found in the cerebrospinal fluid removed by lumbar puncture *Nervous system*

Skin Bile pigment usually appears in the skin soon after it does in the conjunctiva but in the hæmolytic jaundice of pernicious anæmia the latter usually escapes In obstructive jaundice the colour of the skin gives no indication whatsoever of the amount of bilirubin present in the serum In the deep green jaundice of prolonged obstruction there may be less pigment in the serum than in early stages when the skin is just beginning to show a yellow tinge This suggests that the skin is used as an alternative organ of excretion though as will be pointed out later it does not usually escape by sweat It is merely stored up in the skin as if to free the more vital structures Pruritus is a more troublesome symptom but it is inconstant Here the bile salts are responsible as they cause alteration in surface tension which set up currents of lymph between the prickle cells The patient indulges in much scratching but without relief for as he often says and truly the itching is beneath the skin *Skin*

Secretions Saliva tears and milk are not bile stained in jaundice It is frequently stated that the sweat is bile stained but this is exceptional Nasal and bronchial mucus is not tinged with bile Inflammatory and passive exudates are however invariably bile stained Thus if mastitis occurs in jaundice the milk will be coloured with bile The expectoration in bronchitis is not coloured but if pneumonia occurs as a complication bile at once appears in the sputum In a case of jaundice without pneumonia the occurrence of bile-stained sputum is of serious import being evidence of heart failure Fluid in the pleural or of abdominal cavity being either the result of inflammation or of passive exudation will accordingly be coloured by bile in jaundiced patients

In conclusion it will be observed that apart from an unpleasant but harmless discoloration produced by bile pigments all the important symptoms in jaundice are due to bile salts Their absence from the intestine causes steatorrhœa and wasting from deficient absorption of fats increased intestinal putrefaction and constipation Their presence in the blood causes bradycardia headache depression pruritus and sometimes subcutaneous hæmorrhages

TREATMENT The treatment of jaundice must depend upon the cause but the following general principles are applicable During the initial stages the

patient should be confined to bed Although calomel is only indirectly a cholagogue it may be given in doses of ½ gr every hour for six doses, this often relieves the vomiting, and has the additional advantage of being aperient without causing drastic purgation, which should be avoided Ten hours after beginning the calomel treatment a seidlitz powder should be given, for repeated doses of calomel if not effective in opening the bowels, may set up mercurial stomatitis Alkalies ... the vomiting persists ...ion as the state of the ...d be substituted as a diluent and disinfectant of the bile Hexamine is frequently used in an alkaline medium along with salicylates as a biliary antiseptic Preparations of bile salts *e g*, decholin and felamine have proved efficatious in certain cases In toxæmic cases the patient should be encouraged to drink large quantities of water and the like With the onset of severe symptoms it is advisable to purge freely and to give an intravenous infusion of a pint of normal saline at body temperature Venesection has the advantage of removing toxins while infusion dilutes them Theocinacetate in 2 gr doses is a useful diuretic As dextrose is the most easily metabolized food stuff in this state, it should be given by mouth or rectum

In even mild cases the diet will naturally be light Milk is usually regarded as the mainstay, but owing to its comparative richness in fat it is not really suitable and is often much disliked by the patient It is preferable to give barley water flavoured with lemon, with the white of an egg, and a teaspoonful of plasmon to each half pint Tea is usually forbidden though it is difficult to see on what grounds, jaundiced patients often crave for it and if made in the Russian fashion without milk, but with a slice of lemon in it, it seems free from objection If the practitioner feels reluctant to abandon milk, it should be separated or thoroughly skimmed to get rid of as much fat as possible A grain of sodium citrate should be added to each ounce of milk, to diminish curdling Benger's food made with water, cow's foot jelly and lemon sponge can usually be taken without difficulty Alkaline mineral waters may be given freely

When the bile pigments have returned in the fæces in obstructive cases the patient feels much better though still jaundiced, he can now get up, and the diet should be cautiously increased There is sometimes considerable depression during convalescence, for which strychnine and calumba may be given Dilute nitro-hydrochloric acid in 10 min doses is often recommended, but should not be given until all signs of obstruction have passed off For pruritus, hot alkaline baths may be tried, or some of the following preparations a lotion of 1 dr creolin and 1 oz glycerine made up with 10 oz of water, an ointment of 20 gr camphor, 30 gr menthol and 1 oz vaselin, a dusting powder of 1½ dr camphor, ½ dr zinc oxide and 1 oz starch powder, a paint or inunction of 2½ dr ichthyol 3 dr absolute alcohol and 2 oz either Other preparations which may help are Eichoff's superfatted ichthyol salicylic acid soap, prepared by means of colon, or 10 per cent of anæthesine in olive oil Thyroid extract in ½ gr doses may help by diminishing the formation of bile salts

51. Kala-azar. See page 323

52. Lumbago

This denotes a pain in the lumbar muscles due to inflammation of the connective tissue between the muscle fibres It might also extend and affect the fasciæ ligaments, tendons and nerve sheaths in the lumbar region of the body It is met with in persons of both the sexes and in all stations of life In most cases the cause can be attributed to exposure, wet or cold or to a chill, but the

exciting cause is frequently a strain or even a trauma to the lumbar muscles This combination of trauma and exposure in the causation of fibrositis is mostly seen in the male sex and during the active periods of middle life Besides, some form of chronic or subacute infection is said to be responsible for the condition Gout endocrine dysfunctions and the influences of changes in climatic conditions are also suggested ætiological factors Lumbago from physical injury of the tissues as a result of a blow or sudden wrench is a form of fibrositis where the devitalised tissues are invaded by bacterial toxins the sites of infection being in foci like teeth tonsils, nasal sinus, intestines and the biliary apparatus This type of fibrositis may start with minor pains in the back but frequently its onset is acute The spasm of the muscles relaxes at times and the patient is then much relieved The pain is referred to the lumbar muscles and aggravated by movements of the lumbar spine The cramp like pain is at first limited to the muscles which may afterwards diffuse and spread over the ilium or into the loin The lumbar regions on examination are found to be very tender at this stage and the patients are usually most comfortable lying on the back on a firm bed Occasionally the inflammatory process may extend to involve the sheath of the sciatic nerve, resulting in sciatica Generally an acute attack takes 3 to 4 weeks to subside but is liable to recurrences In chronic cases of fibrositis organisation of fibrous tissue and thickening of the walls of the blood vessels and nerve sheaths in the area involved takes place

TREATMENT The general treatment of this type of fibrositis includes absolute rest in bed during the acute stage of the disease avoidance of over fatigue and occupations involving strains to the part thorough investigation for septic foci in the body and their eradication when detected regulation of the bowels and elimination of dietetic principles leading to dyspepsia colitis obesity and lastly avoidance of sudden changes in temperature Drugs that are mostly used are analgesics including the coal tar series aspirin phenacetin etc and in acute lumbago the relief of pain may be obtained with codeine or barbiturates allonal or veramon Sometimes the intramscular injection of ¼ gr of morphine or 5 c cm of a 1 percent solution of hydrochloride of quinine and urea may be required to inject deeply into the tender nodule for the relief of acute pain If there is a tendency to gout atophan 10 gr three times a day for three days in the week is of benefit The drug however should not be used where the hepatic functions are deranged For non specific protein therapy see page 1418 Endocrine therapy is of particular value in cases where glandular deficiencies are suspected Physical therapy is more effective than drugs in these cases During the acute stage absolute rest in bed should always be aimed at and relief of pain may be obtained by immobilisation with strapping by analgesic liniments and poultices and especially by local radiant heat Ionisation with potassium iodide and salicylates diathermy and local ultra violet light are also of benefit at this stage Elimination of toxins may be encouraged with spa treatment and measures should be adopted to promote the healthy action of the skin such as by radiant heat vapour baths etc Absorption of exudates is generally aided by heat elastic pressure counter irritation and ionisation and breaking down of the fibrous tissues by dry or douche massage When the pain diminishes in severity deep massage of the lumbar muscles should be employed combined with gentle active and passive movements of the back In chronic long standing cases the body resistance should be raised by means of general ultra violet light and wasting of muscles prevented by massage and faradic stimulation *Treatment*

Biopsy In a readily accessible swelling such as a tumour involving the tongue, the floor of the mouth the lower portion of the rectum or the region of

the cervix uteri the clinician should remove a portion of it and submit it to a histological examination Such a procedure is likely to spread the tumour by the lymph or the blood channels if it is malignant This can be probably avoided by the use of a diathermic knife Whenever possible the portion selected for removal should be at the junction of the normal tissue and and the suspected tumour and it should be cut at right angles to the surface

Biochemical examination It includes an ability to diagnose cancer from an examination of the blood or the blood serum One of the latest of these is that claimed by Bendien by a flocculation test of the blood serum

X ray Under certain circumstances radiograms of the parts give most important aid in the early diagnosis of malignant disease especially in suspected disease of the stomach and alimentary tract or the lungs with no associated tumour or swelling Radiograms are of particular value in the investigation of suspected tumours of bone

Exploratory operation An exploratory operation is often desirable to confirm a diagnosis and ensure subsequent successful treatment The clinician the radiologist the clinical pathologist and possibly the anatomist should all co operate to make the diagnosis a correct one at the early stage of the disease As soon as the diagnosis is confirmed by an exploratory operation it is often desirable to completely remove the diseased tissues where possible and if not to perform some other operation for a temporary relief of the patient s condition

53 Malta Fever (Undulant fever). See page 833

54 Measles

The disease seems to be due to a filterable virus which is present in the patient s blood and can be transmitted to other susceptible human beings and monkeys One attack confers immunity against sub equent attacks The highest attack rate occurs in children between the ages of 3 and 4 Fatality is at its maximum in the first year of life and it remains high till the third year Aetio logical factors are exposure to infection under nourishment (victims of avitaminosis) debility and unfavourable hygienic conditions of living Incubation period is 14 days

DIAGNOSIS It is made from symptoms of coryza fever and characteristic rash

TREATMENT No specific remedy is known (1) *Sick room* The patient should be entirely isolated the room should be large well ventilated and sunlight should have free access (2) *Diet* Fluids tolerated are sweetened lemonade barley water lime whey milk and plain water (3) *Attention to the mouth and nasal passages* is most essential to prevent subsequent complications such as otitis media suppurative adenitis and broncho pneumonia Laryngitis disappears with the appearance of the exanthem Mild antiseptic alkaline lotions like sodium bicarbonate and glycothymoline are useful for cleansing the mouth A prescrip tion with potassium chlorate taken internally is almost specific in alleviating stomatitis and preventing ulceration and cancrum oris (4) If diarrhœa is present grey powder and lime water are useful (5) Treat on general lines if complica tions such as pneumonia and emphysema set in (6) Latest so called specifics are pyramidon ultraviolet ray therapy but results are not encouraging (7) *Serum therapy* Convalescent serum has been used both in prophylaxis

and treatment in the acute stage Donors must be healthy and not exposed recently to any infectious disease The blood is withdrawn 10 to 14 days after defervescence and amounts up to 20 c.cm from a child of 5 years 100 c cm from a child of 10 years and 250-500 c cm from an adult may be taken The clear serum is withdrawn and tested for W R and sterility It is customary to filter the serum and add phenol or other preservative the ampoules are stored at 4°C To afford complete protection a minimum dose of 5 c cm of the serum is given intramuscularly within the first five days after exposure to infection To produce an attenuated attack the same dose is injected between the 6th and 9th day after exposure or preferably half the above dose is given before the 6th day Sometimes whole blood injection from parents to children contacts is given The approximate dose in such cases is double that of convalescent whole blood and 4 times that of convalescent serum After such sero attenuation the attack is always mild and uncomplicated (8) Mixed vaccines may be used when resolution is delayed or recovery incomplete (9) Maline method of disinfection The contacts are dosed with eucalyptus oil and the patient s tonsils and pharynx are swabbed with 10 per cent carbolic oil and he is put in a gauze tent sprayed with eucalyptus (10) Aspirin 5 gr Dover s powder 2½ gr and phenacetin 2½ gr are useful Alkaline mixtures should be prescribed during the febrile period and sedative expectorants are given for coryza

55 Migraine

This is usually described as a paroxysmal affection with severe unilateral headache preceded by visual phenomena and followed by nausea and vomiting Sometimes one symptom is sufficient to represent an attack of migraine The characteristic periodic headache with other symptoms such as irritability confusion loss of appetite giddiness photophobia etc is diagnostic of migraine Though termed hemicrania the headache is not always unilateral Repeated attacks of migraine result in severe mental and physical prostration and this is again followed for some time by severe neuralgic pain over a limited area of the head or face Inequality of p [illegible] *Definition*

w [illegible]

S [illegible]

to [illegible]

(1) *Alimentary type* Dysfunction of the gastro-intestinal tract including the biliary apparatus has been thought to be a potent aetiological factor and bilious abdominal and duodenal types of migraine are recognised These facts cannot be ignored as the treatment of hepatic dysfunctions with glucose decholin tablets etc has relieved many migraine attacks (2) *Allergic and dietetic type* Migraine has been regarded as an anaphylactic shock Non specific protein therapy has also been tried on the basis of such an assumption though sometimes the taking in of a particular article of diet has precipitated an attack and the treatment has been to exclude this article from the dietary without effect (3) *Endocrine type* Endocrine dysfunction has been regarded as a common aetiological factor This is particularly marked in ovarian dysfunction where migraine occurs at the menstrual periods Excellent results have followed the administration of *emmenin complex* (Collip s placental hormone) ½ to 1 dr twice daily except during the menstrual period in such cases Thomson recommends three injections of theelin each 1 c cm to be given in the week before the period is due It is suggested that such treatment causes a diminution in size of the pituitary which would otherwise cause headache by pressure against the sella turcica or a large diaphragma sellae (4) *Metabolic type* Errors in diet faulty

Alimentary

Allergic type

Endocrine t

metabolism and defective elimination of waste products are considered to be causal factors in precipitating an attack of migraine. The onset of migraine in the early hours of the morning, starvation, prolonged physical strain and its subsequent relief by administering glucose, all go to confirm the metabolic factor. (5) *Ocular type* Subjects with defective vision due to errors of refraction and slight ocular muscle imbalance are known to suffer from intense unilateral headache. *Correction of such defects with correct glasses has very often relieved* the distressing symptom. (6) *Para epileptic and cerebral type* The close similarity between migraine and epilepsy has led to the treatment of the para epileptic type by bromides, luminal and ketogenic diet. Symptoms of cerebral tumours and other intracranial lesions closely simulate those of migraine and this led to the recognition of the cerebral type of migraine. (7) *Psychological type* Psychological factors, such as mental overwork, anxiety, 'suppressed rage and humiliation', play an important role in the ætiology of migraine. Psychotherapy has improved many such cases. (8) *Vasomotor and sympathetic type* Migraine is thought to be the result of a localised intracranial œdema. The advocates of the sympathetic origin of migraine hold that the disease is due to an excessive stimulation of the sympathetic system resulting in spastic contraction of the cerebral arterioles with their subsequent relaxation. Calcium therapy and the administration of irradiated ergosterol have been beneficial in these cases. Lennox tried ergotamine tartrate in the treatment of migraine. It is probable that the benefit derived from ergotamine in migraine is due to its effect upon the smooth muscle of the cerebral blood vessels. It is likely that ergotamine abolishes the pain by increasing the tone of the cerebral vessels and hence diminishing their stretch. The doses of the drug recommended are 0.5 mg subcutaneously or 1.0 mg by the mouth. If the headache is not relieved the dose can be repeated after an interval of 2 to 3 hours. The drug should not be used in pregnancy and cardiovascular diseases. A few untoward symptoms such as vomiting, increase in systolic blood pressure, decrease in pulse pressure, and bradycardia may be met with after its administration.

TREATMENT ... and thorough investigation of the case ... here possible, is necessa... and in between the attac... oved to a dark quiet room and sedative drugs such as veramon (6 gr.), phenacetin (10 gr.), caffeine citrate (5 gr.), compral (3 tablets) etc., may be tried to relieve the pain; luminal (½ to 1 gr.) has given good results. Between the attacks drugs discussed under the ætiological factors may be tried. A useful prescription in ...

56. Molluscum Contagiosum

This is an infectious type of epithelial overgrowth consisting of rounded or flat papules from pinhead to bean size, pearly gray, with a central depression from which a caseous plug called the molluscum body, may be squeezed. The molluscum body contains only degenerated epithelial cells and keratin. The principal sites of involvement are the face, hands and genitals but they may be widely distributed.

TREATMENT Manual expression and cauterisation with trichloracetic acid diluted or undiluted.

57 Mumps

It is an acute infectious disease characterised by parotitis and constitutional disturbances Mumps is due to a filtrable virus present in saliva (Kermorgant) *Causes* The incubation period is longer than general infectious diseases and is usually between 18 to 22 days One attack usually confers immunity for the rest of life A second attack is very rare *The complications* Orchitis is common but atrophy of the testis is rare, pancreatitis is rare, encephalitis or meningo encephalitis meningitis, polyneuritis arthritis, occur

DIAGNOSIS (1) Make a careful examination of the fauces to exclude hypertoxic diphtheria (2) Presence of orchitis in males in absence of gonorrhœa *Diagnosis* and with a history of facial swelling (3) Lumber puncture In genuine mumps cerebrospinal lymphocytosis is constant and marked in early stages and lasts for several months

TREATMENT (1) Rest in bed during the acute stage (2) Erotic excitement of any kind should be avoided as well as any sort of violent exercise as riding *Treatment* or cycling for some weeks after the attack (3) Mouth to be kept clean by gargles and mouth washes, potassium chlorate 10 gr tincture of lavender 10 min glycerine acid boric 1 dr water up to 1 oz to be diluted with an equal quantity of warm water before use (4) Locally hot fomentation icthyol and belladonna paint are useful (5) Injections of salvarsan and other arsenicals are advocated (6) Orchitis suspensory bandages lead and opium compresses

58 Myiasis

It is due to the invasion of the skin and subcutaneous tissue by the larvæ of *Cordylobia anthrophaga* or an allied species of fly This condition may be *Causes* cutaneous nasal or intestinal It is not known how infection takes place, but it is possible that the fly lays its eggs apparently about 150 at a time, on the ground and that the larvæ creep from the earth on to their human hosts perhaps when the latter are sleeping on the ground It is also possible that the fly lays its eggs on clothing as when the latter is put out to dry it exhales the odour of sweat and so attracts the fleas There is no evidence to show that oviposition takes place directly on the skin Its usual host appears to be the domestic dog the skin of the scrotum being specially affected The lesion produced is like a small boil or urticarial wheal, in the centre of which there is an opening which may be obscured by the discharge or it may be patent

TREATMENT Instillation or local application of pure chloroform is the usual remedy Insufflation with calomel has also been tried with success

59 Neuralgia

It denotes pain which follows the distribution of certain nerves in the body It is generally due to fibrositis confined to the connective tissue forming the sheath *Definition* and surrounding the fibres of the nerve Besides, an undue toxic state of the blood [illegible] The toxins in the blood [illegible] vaso-constriction deprive [illegible] pain is due to congestion [illegible] erve An irritant causing [illegible] ictor The condition may [illegible]ect any nerve in the body but the nerves commonly involved are the sciatic,

brachial, peroneal, intercostal, occipital, facial and trigeminal. The ... is found
fluid exu
usually confined to the interstitial tissue but sometimes a true neuritis or ner atrophy results from pressure of scar tissue on the nerve elements. Senso disturbances, such as paræsthesia, tenderness and pain aggravated by stretchi of the nerve often appear and in severe cases motor paralysis or trophic chang are also met with.

SCIATICA. Pain along the sciatic nerve may be due to causes other th fibrositis. Sciatica may be caused by a loaded rectum, by uterine and ovari displacements, by tumours and disease of the spinal cord itself and such possib factors should always be carefully and exhaustively investigated before the pa is pronounced to be due to neuralgia, and treated as such. It is important determine whether the pain is due to pressure, or to some factor in the ner itself or in its sheath. If caused by pressure the pain will not be sensib aggravated when the nerve is put on the stretch, it may be to some extent relie by the process, whereas, when the mischief is in the nerve or its sheath the stretc ing will obviously increase the pain. In order to set this point at rest, the patie is placed upon his back and the pelvis firmly fixed against the bed by an attendan The limb on the affected side, which must be kept fully extended at the kne is then gently and gradually raised by the examiner until it is at right angles the couch. This will put the nerve on stretch and if no aggravation of pa results, then the cause is to be sought outside the sheath of the nerve. The cond tion starts with pain in the back of the leg aggravated on straightening the kne especially if the thigh is flexed. Afterwards the pain becomes acute and consta and the course of the nerve becomes very tender on palpation. The distributio of pain and tenderness however depend on the part of the nerve affected. I addition to the characteristic pain in sciatica, the presence of wasting of th gluteus maximus muscle considerably aids the diagnosis. Points of maximu tenderness are located at definite sites of the distribution of the nerves. Th duration of an attack is variable and the ultimate prognosis is generally hopefu

Treatment. The treatment of sciatica in the early stage demands rest, counte irritation and analgesic drugs for the relief of pain. In cases of strain, correctio of the fault is of the first importance. T ... d depend of course, on the lesion. If manipulatic
of treatment in form of heat, local massa
Radiant heat is most useful, and the infra red rays have been used with goo effect and ultra violet light is of some value in the most superficial forms o fibrositis. Diathermy is useful in bringing the affected area under the direc influence of heat but in the majority of cases heat applied to the surface appear to be more effective. Ionization applied to the buttock sometimes proves usefu especially in neuritis. The effect is due rather to the action of the current o the tissues than to the drug used. Massage is a valuable method of treatmen relieving the deep seated congestion, restoring muscular tone, removing th

d with radiant heat, hot bottles poultice
e or tincture of iodine may be applied dail
to the line of the sciatic nerve on the skin until the skin is on the verge of bliste formation. Aspirin, phenacetin, caffeine and allonal are the most useful analgesi drugs for the relief of pain. In the more resistant cases injection of oxyge

usually affords much relief The technique is easy, harmless and painless A pneumatic cushion is formed by distension of a wide area around the nerve due to introduction of oxygen through a hypodermic needle connected by thick Indiarubber tubing to an oxygen cylinder Injection of a salicylic acid solution in doses of 15 to 30 min (1 in 20 of sterile water) very often gives relief A preliminary injection of cocaine should be given before the injection is given as this might cause pain afterwards Acupuncture of the nerve is not performed nowadays and open operation to stretch and free the nerve from adhesions is a better procedure which often gives relief in a severe acute attack of sciatica When the acute stage is over physical therapy in form of immersion baths with underwater douche massage over the nerve and subsequent manipulation is of value and the patient should be asked not to make any sudden movement that will stretch the nerve

Harris advocates an injection of normal saline at the sciatic notch or the gluteal fold the dose is 20 to 100 c cm and this is preceded by the injection of a few drops of novocaine solution It is very effective in perineuritis and particularly when the site of the trouble is in the region of the sacro iliac joint Injections of oxygen and even air have given relief in some cases probably by breaking down adhesions and reducing congestion

Before treatment is commenced a search should be made for septic foci and when found these should be eradicated Metabolic disorders should be corrected on similar lines

Brachial neuri

In interstitial neuritis of the brachial plexus either the whole plexus or certain roots only are involved The site of pain depends on the distribution of the nerves and there are usually no motor trophic or sensory changes The pressure due to vertebral diseases a cervical rib or involvement of glands in the axilla may be responsible for the pain In brachial neuritis the onset is usually sudden and the pain is made worse by abduction and circumduction of the arm Tenderness is particularly marked over the upper half of the deltoid muscle as the axillary nerve is usually involved in the inflammation The arm should always be supported in the abducted position *Intercostal neuralgia* may be caused by fibrositis of the intercostal nerves or muscles and is generally accompanied by intense acute pain simulating that of pleurisy or by pressure on the nerves by mediastinal growths In neuralgia of the twelfth thoracic nerve the pain and tenderness are superficial and the condition is very often wrongly diagnosed as appendicitis Similar involvement of the occipital nerve causes severe headaches especially in the morning with tenderness over the course of the nerve A true Bell s palsy is due to involvement of the nerve after its emergence from the stylo-mastoid foramen by pressure of a parotid tumour or as a result of common cold etc. Irritation within the buccal cavity is also a frequent cause of facial neuralgia Radiograms of the teeth will reveal any anomalies and malformations which act as sources of peripheral irritation The treatment of the above conditions is the same as that of lumbago

Intercostal neuralgia

Neuralgia of Blood disorders

In neuralgia of unsatisfactory blood states chiefly due to anæmia the treatment resolves itself into the treatment of the anæmia by suitable hygienic dietetic and medicinal means An outdoor life in a bracing climate is the best hygienic treatment in these cases The diet should include abundance of vitamin containing foods in which butter and cream should receive a prominent place Fats seem to be concerned in some very special manner with the nourishment of the nervous system and in the form of butter and cream they may be freely given to these patients Alcoholic drinks may be allowed only in moderation Iron is the best drug in these cases but the stronger salts the sulphate and perchloride are much

less efficacious than the citrates *and tartrates* The two latter are readily assimilated whereas the former are very *apt to upset the* stomach A useful formula is citrate of ammonium and iron 10 gr, alkaline liquid extract of arsenic *2 min and watery infusion of quassia to ½ oz, to be taken* thrice daily after meals When the patient *improves, the following* may be prescribed citrate of quinine and iron 20 gr, alkaline liquid extract *of arsenic 5 min, tincture* of nux vomica 4 min and orange water to ½ oz to be taken *thrice* daily after meals The pressence of quinine even in such doses may help to subdue the neuralgia In prescribing preparations of *iron the bowels* should always be kept open, this is best done by aloes at first because this *drug enhances* the effect of iron and later cascara should be given A *daily morning do e* of a natural mineral water is also very useful When the neuralgic pain is severe drugs having a direct influence upon the pain should *be prescribed A useful prescription for the purpose* is hydrochloride *of* quinine 5 gr, dilute hydrobromic acid 20 min tincture of gelsemium 10 min and chloroform water to ½ oz to be taken *every 20 minutes* till the pain ceases and not more than 4 doses to be taken

The state of the blood in goutiness is highly provocative *of neuralgic pains* and so iodide of potassium is very useful in these cases Sometimes the following *may help* salicylate of sodium and phenazone each 5 gr syrup of ginger 1 dr and chloroform water to 1 oz to be taken every 15 *minutes until pain* ceases and not more than four doses should be taken This is a *most admirable* combination in migrainoid neuralgic attacks *to which the gouty are peculiarly prone* A fruitful and easily overlooked cause of neuralgia especially in women is toxæmic condition induced by chronic constipation Along with the usual treatment of constipation neuralgia should be treated with phenazone and the salicylate mixture quinine and gelsemium are to be preferred where the patient is anæmic and emaciated *In them peripheral irritation from septic* teeth tonsils errors of refraction etc should always be borne in mind

a pill of 5 gr every half hour until the pain ceases [illegible] given It is usefully combined with gelsemium which has a selective influence over cranial neuralgias Locally liniment of aconit painted over *the painful* area is sufficient to cut short an attack For vague ill defined neuralgic pain chloride of ammonia 20 gr *combined with tincture of cimicifuge 20 minims* is effectual Acetanilid (antifebrin) is a valuable drug for the relief of neuralgic and neuritic pains It is better to prescribe the drug cautiously in small doses (2 gr) for fear of its untoward effects Apart from morphia this drug is the most powerful anti neuralgic insamuch as it relieves the pains of locomotor ataxy and of other organic diseases of the nervous system The drug is practically insoluble in water and so is best given in cachets combined either with salicylate of sodium *(10 gr) or camphor monobromate* (6 gr) Morphia is unequalled regarding its effects in relieving intense neuralgias accompanying fevers like influenza and other toxæmias but its prolonged use in recurrent neuralgias is undesirable In full blooded individuals leeching often affords relief in neuralgic pains and this is of particular value where the pain seems to be in or to radiate from the ear

TRIGEMINAL NEURALGIA Sigwald in discussing the various methods of treating trigeminal neuralgia favours section of the *trigeminal nerve* above the Gasserian ganglion This however is a serious operation which belongs to the scope of the neuro surgeon *and not the general* practitioner and so other methods

of treatment have frequently to be relied upon rather than such a severe procedure Injection of alcohol into the nerve certainly relieves many cases though it may not cure the condition Radiotherapy has also had successful results therapeutic X rays being directed to the ganglion Ionization with aconite or with calcium chloride has also proved successful, carried out thrice weekly for a month A prescription containing aspirin 6 gr, pyramidon 4 gr, opium powder 1/3 gr may alleviate the severe pain for a time Injections of parathyroid extract, insulin and horse serum have also brought about temporary alleviation

60 Non specific Protein Therapy

Non specific protein therapy or protein shock therapy consists essentially of the injection of a protein either in the form of a sterile solution of albumose or a bacterial vaccine by the intravenous or intramuscular route

Definition

Within the last few years this form of therapy has gained considerable popularity The value of non specific therapy was empirically established many years ago Bokenham (1896) reported that diptheria antitoxin was effective in typhoid and streptococcal infection Rumpf (1893) treated typhoid patients successfully with pyocyaneus vaccine Koch and Matthes observed that tuberculous patients reacted not only to tuberc
Renaud (1911) found that a typhc
definite therapeutic effect on a num
origin Kraus and Mazza (1914)
as typhoid vaccine in puerperal
treatment with purely non specific proteins such as Coly's fluid autoserum whole blood milk intramuscularly and intravenously have been reported But the place of non specific protein in treatment was definitely established as a sequel to Wright s vaccine therapy in 1916 Since then the agents used in the past few years with the idea of immunizing the patients are legion The therapeutic effect produced by these substances though considered different previously, are now considered to be of the same type These substances act as non specific stimuli to the normal immunity mechanism and help to produce the various re actions on which depend the beneficial effects

The non specific proteins that have been commonly employed are —

Varieties of non specif proteins u

1 BLOOD AND BLOOD SERA (*a*) *Whole blood* either citrated or not may be given subcutaneously or intramuscularly in doses o 10 c cm (*b*) *Normal sera*, human horse sheep ox, goat etc. (*c*) *Immunesera e g* human convalescent sera pneumococcus streptococcus and dysentery sera diphtheria and tetanus anti toxin

2 PROTEIN SOLUTIONS (*a*) *Proteins of animal origin* Nowadays milk is the chief agent employed 2 to 10 c cm being given intramuscularly twice a week aolan which is a preparation of milk is often used Other proteins of this nature are egg albumin serum albumin casein snake venom etc

(*b*) *Proteins of plant origin* Nucleic acid and sodium nucleinate are used the dose is 0 5 gm hypodermically or intramuscularly in 5 per cent solution Other examples are agar agar pollen extracts etc

(*c*) *Protein split products* Proteoses prepared from milk are given daily in doses of ½ to 2 c cm of 2 to 10 per cent solution Peptone for the production of shock is used in 10 per cent solution in doses of 5 to 10 c cm intravenously Peptones are also used in hæmorrhagic diathesis paroxysmal hæmolgobinuria septicæmia and in allergic conditions, for which 5 per cent solution is given

intravenously and 7 5 per cent solution *intramuscularly in doses of 5 to 40 min* Peptones, *e g*, Witte's peptone, are also given by mouth

3 ENZYMES Trypsin, amylopsin and leucocytic extracts

4 BACTERIAL PRODUCTS *Typhoid vaccine* in doses of 25 or more million organisms intravenously *Bact coli* vaccine 20 or more *millions Coly s fluid* for malignant tumours Malaria inoculation in parasyphilitic condition Tuberculin has also *been used in non tuberculous subjects*

5 TISSUE EXTRACTS Spleen extract has been used in hœmopoietic diseases and allergic skin conditions, 5 c cm of 40 per cent solution is given on alternate days for 12 injections. *Tumour extracts, autolysates, vascular and muscle* extracts are also used

6 CHEMICALS AND OTHER COLLOIDAL METALS Gold silver, manganese sulphur iron *platinum mercury and antimony are used These substances when* employed non specifically are said to act by breaking down inflammatory tissues *with resulting* protein absorption *Similarly* X rays, radium cauterization, diathermy, freezing with CO_2 snow, and ultra violet treatment may be considered to be indirect methods of protein therapy

7 *MISCELLANEOUS. Hyper and hypotonic salt solution, distilled water,* glucose, etc

Character of reaction Certain focal and general reactions develop during treatment which depend upon a variety of factors such as age of the patient ... and the dosage employed

reaction is the general stimulation of the whole ... against an irritant introduced in the circulation and that this reaction in some *cases may* lead *to inhibition or even destruction* of the causative organisms of disease A focal reaction is always desirable, but the best results are obtained when it is slight *It consists of an intensification of any local inflammatory* process followed by a diminution until the original condition is reached Generally within fifteen minutes of the injection *chill or rigor may occur, which passes off* within half to three-quarters of an hour A rise in temperature occurs which varies with the patient and the agent employed When a vaccine is given intra venously a maximum temperature of about 104°F may be reached in 3 to 4 hours while with milk intramuscularly the maximum is attained in 6 to 8 hours Increase in pulse rate and rise in blood pressure are to be expected On the leucocytes the effect is a primary leucopenia, probably due to the accumulation of the *leucocytes in the viscera*, later this is followed by leucocytosis which reaches its maximum in 4 to 8 hours Very strong stimuli produce long continued leucopenia *followed by hyperleucocytosis.* The degree of these reactions has different significance for different diseases In cases of chronic diseases such as arthritis marked focal and general *reactions are indicative* of a beneficial effect while in diseases like asthma or typhoid fever, such reactions will be harmful

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Cellular cl

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Character of reaction Certain focal and general reactions develop during treatment which depend upon a variety of factors such as age of the patient nature duration and type of illness the choice of protein and the dosage employed. The general and focal reaction is the goal aimed at in non specific protein therapy though no satisfactory explanation has been offered as to the manner in which it influences the process of the disease It seems likely that the mechanism of the reaction is the general stimulation of the whole defensive forces of the body against an irritant introduced in the circulation and that this reaction in some cases may lead to inhibition or even destruction of the causative organisms of disease A focal reaction is always desirable but the best results are obtained when it is slight It consists of an intensification of any local inflammatory process followed by a diminution until the original condition is reached Generally within fifteen minutes of the injection chill or rigor may occur which passes off within half to three-quarters of an hour A rise in temperature occurs which varies with the patient and the agent employed When a vaccine is given intra venously a maximum temperature of about 104°F may be reached in 3 to 4 hours while with milk intramuscularly the maximum is attained in 6 to 8 hours Increase in pulse rate and rise in blood pressure are to be expected On the leucocytes the effect is a primary leucopenia probably due to the accumulation of the leucocytes in the viscera After this is followed by leucocytosis which reaches its maximum in 4 to 8 hours Very strong stimuli produce long continued leucopenia followed by hyperleucocytosis The degree of these reactions has different significance for different diseases In cases of chronic diseases such as arthritis marked focal and general reactions are indicative of a beneficial effect while in diseases like asthma or typhoid fever such reactions will be harmful

Following vaccine therapy headache is quite common Nausea vomiting and rpes occasionally occur The coagulation time of the blood is said to be minished metabolism and glandular activity are augmented The injected eign protein is said to be removed from the blood stream by the cells of the culo endothelial system

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Gonorrhœa and its complications Milk injections have been used with satisfactory results in both gonorrhœal urethritis and its complications Autoserum has been recommended for gonorrhœal prostatitis and equally good results have been obtained with auto hæmotherapy Milk bacterial vaccines such as typhoid and *Bact coli* have also been used Apparently it seems that non specific methods give just as good results in the treatment of gonorrhœa and its complications as the specific gonococcal vaccines and antiserum *Milk injections*

Other miscellaneous affections have been treated with non specific therapy in iritis and gonorrhœal ophthalmia milk injections are said to act like a specific remedy Beneficial results often follow the use of milk in cases of keratitis choroiditis conjunctivitis corneal ulcers etc

in decreasing the growth of tumours have been described Recently non specific therapy has been employed to cause local vasodilatation in such disease as Raynaud s disease thromboangitis obliterans and arteriosclerosis

MODE OF ADMINISTRATION The patient should have a liberal carbohydrate meal 2-4 hours before injection and preferably a feed of glucose one hour before it He should be in bed during the period of reaction and allowed to drink plenty of fluids a small dose of codeine or adrenalin should be given to shorten the reaction and lessen the discomfort

Injections may be given intravenously intramuscularly cutaneously and sub cutaneously Injections are given usually at a distance from the lesion but may also be injected locally around it These are administered at short intervals of 2 to 4 days as too long an interval may produce anaphylactic shock The dose should be sufficient to cause a general moderate reaction

Contra indications Although there is less risk of anaphylactic shock with this treatment than with specific desensitization there are certain dangers associated with it Milk is liable to give rise to these symptoms autoserum and autohæmo therapy are less liable to cause them The patient who is undergoing this treat

given as a contra indication but it may be mentioned that pregnancy dermatoses have been successfully treated Patients with chronic myocardial changes and advanced arteriosclerosis should not be treated by these methods Pulmonary diseases especially tuberculosis may show focal reactions after non specific protein injections and care must therefore be exercised in these cases

It thus appears that provided certain precautions are taken non specific therapy is a safe and useful method of treatment for many diseases The best results are obtained if it is combined with suitable general or local drug treatment It is not very important which form of protein is used whether autohæmotherapy milk or bacterial vaccines provided the dosage is regulated not to cause too severe reaction

which are common to all infections and conditions in which sensitization has occurred and so enables the individual to desensitize or immunize himself It is significant in this connection to note that an attack of one disease often has a beneficial effect on another entirely different in origin from which the patient may be suffering at the same time

THERAPEUTIC USES *Infectious diseases* Infectious diseases e g typhoid tuberculosis have been treated with non specific proteins But it should not be used indiscriminately as in this way there is chance of converting an otherwise latent infection into an acute one It is particularly suitable in localised rather than generalised infection and where the disease is of an undetermined nature or where the foci of infection cannot be reached for preparation of a vaccine When the specific therapy has proved of little value non specific therapy may in such cases reactivate the healing mechnism One or other of the bacterial vaccines or whole blood may be injected in these cases

Arthritis Non specific protein therapy is most commonly employed in arthritis (see page 10/9)

Asthma and other allergic conditions In alle gic conditions non specific therapy has been used with advantage (see page 1084)

In other allergic conditions such as urticaria and angio neurotic œdema localised and generalised pruritus and pemphigus autohæmotherapy and autoserotherapy have been tried After withdrawal of blood form a vein it is reinjected intramuscularly after defibrination in doses of ½ to 2 c cm every 24 hours or less or as freshly separated serum in doses of 2 to 4 c cm repeated at 2 to 7 days interval until a dose of 10 c cm is reached In case of urticaria and angioneurotic ædema the best results have however been observed with injections of 33⅓ per cent peptone solution given at first intradermically for the smaller doses and later subcutaneously Urticaria papules in children is said to be cured after one or two injections of mother s serum

Skin diseases In dermatological conditions non specific protein therapy has often proved useful In eczema and dermatitis all methods have been used but the most frequently employed is auto sero and autohæmo therapy Turpentine injections also give just as good results Vaccines (typhoid staphylococcus and streptococcus) have also been used but less frequently Psoriasis has been treated with autoserotherapy auto hæmotherapy intravenous vacines especially typho d milk and its derivatives This form of therapy has been extensively used in lichen planus lupus vulgaris lupus erythematosus leucoplakia chronic X ray dermatitis etc The consensus of opinion seems to be that in most of these dermatological conditions the non specific agents increase the susceptibil ty of the lesions to local treatment and so hasten the cure

6 n e t ons

time An attack of malaria is also known to i u c u j syphilis but it has been found that induced malaria is probably without effect in the early stage while it does good in the later stages This is especially tru in cases of neurosyphilis Within recent years malarial therapy has been very extensively used in the treatment of neurosyphilis and especially in tabes and G P I The malarial treatment has however some disadvantag s it is always

congestive renal changes as met with in the later stages of cardiac failure Prognosis is usually grave in these conditions

Treatment The treatment of cardiac œdema should aim at reduction of the

early stages, it is always better to stick to a low protein and a high carbohydrate diet with a limitation in the amount of fluid intake Efficient measures should be adopted early to avoid a later anoxæmia

Nutritional œdema In this condition the protein of the blood serum is decreased The causes are to be sought in a deficient supply to the body of exogenous proteins in the food excessive loss of protein through urine and from bleeding and lastly from non absorption of nutritious materials from the gastro intestinal tract It is also met with in cases of vitamin deficiency and starvation, in chronic dysentery, in chronic tuberculous enteritis, in sprue, in hookworm infection in piles in pernicious anæmia, in pregnancy and lactation in diabetes mellitus, in chronic alcoholism, in cirrhosis of liver and in cardiac insufficiency These and other factors help in precipitating the condition The ideal treatment in nutritional œdema is to supply an adequate amount of protein in the diet with a restriction in the amount of salt

Nutritional œdema

Oedema in anæmia In anæmia the amount of protein in the blood plasma is much diminished Moreover, associated complications such as the involvement of heart and kidney as seen in pernicious anæmia are also responsible for the condition The treatment in these conditions consists in treating the primary cause and supplying an adequate amount of protein in the diet

Oedema in Anæmia

Allergic œdema In allergic œdemas, different parts of the body are attacked and symptoms too vary in such cases The treatment in such cases aims at finding the cause of allergy and removing it as far as possible Calcium and adrenalin therapy is useful in these cases A small dose of thyroid alternating with ephedrine is able to control it more effectively

Allergic œde

Renal œdema Here œdema may be generalised all over the body or limited to certain places where loose areolar tissue predominates Oedema is due to the

Renal œdema

water, salts and nitrogenous waste products In later stages the plasma proteins are diminished from loss of albumin in the urine and a condition of malnutrition sets in In nephrosis, the œdema is associted with massive albuminuria It is not always possible to attribute the œdema in these cases to a failure of the kidney to excrete salt or water In such cases factors such as the total amount of serum protein, the hydrostatic pressure in capillaries and the ability of the kidney to excrete various ions should be considered to explain the causation of œdema The serum protein is always low (being about 4 per cent) in nephrosis a disorder in which the kidney also is suffering just as any other part of the body would do *Epstein's treatment of chronic nephrosis*—Epstein introduced the high protein diet in these diseases to cut short œdema Epstein believes the effect to be partly due to the specific dynamic action of the protein which counteracts the lowered basal metabolism in this disease, and partly to increase in the protein content

Chronic neph

61 Obesity. See page 167

62. Oedema

Oedema is a condition in which there is an abnormal accumulation of fluid in the intercellular spaces Various theories have been propounded from ime to time to explain the ætiology of œdema Fischer holds that œdema is produced by the pressence of an excessive amount of water in the tissues when the affinity of the colloids of the tissue for water is increased above nomal Under normal conditions the tissue fluid is present only as an ultra microscopic layer of fluid around the cells and according to Fishburg œdema is produced only when such delicately dynamic equilibrium between the tissue fluid the cells and lymph is thrown out of gear About one tenth of the water in the body is in the blood and œdema is produced as a result of changes in the blood Wells holds that œdema is mainly the result of a process of filtration while the vitalistic school maintains it is mainly the result of secretion One is aplethoric condition with increased pressure and the other a diminution of protein contents of the blood in such vessels Starling held that œdema is due to increased permeability of the

produced a condition of hydræmic plethora and thus caused increased filtration

According to a recent theory the capillary wall plays only a passive role in the fluid escape The passage of water and crystalloids in and out of the capillaries is determined by forces on either side of the capillary wall and not by any active function of the latter Fishburg maintains that increased permeability of capillaries plays a part only in cases where the œdema fluid contains considerable quantities of protein With all these various theorie œdema may be defined as a condition in which fluid accumulates excessively in the intercellular spaces in the tissues and in the serous cavities of the body

Oedema occurs in many diseases and a correct knowledge of the factors responsible for its causation is essential for rational therapy The common conditions which bring about œdema are increased capillary blood pressure increased ca

pressure of

The kidney

logical conditions this eliminative process is interferred with specially by sodium chloride but not potassium ammonium and calcium ions Loeb maintains how ever that the difference between the normal and nephrotic kidneys is not so much qualitative as quantitative This quantitative difference is attributed largely to the differences in the serum protein concentration of the blood

CLINICAL TYPES *Cardiac œdema* It is met with in cases of congestive heart failure *where venous pressure is increased* capillary circulation retarded the tissues suffer from lack of oxygen nutrition of the tissue cells is impaired and tissue metabolism is interfered with resulting in an accumulation of excessive fluid in tissue speaces and lastly it is probably associated with some obstruction to the lymphatic outflow In cardiac œdema the fluid is shared by all parts of the body Bolton suggests the origin of the œdema fluid near the cardiac region and the visceral peritoneum It then gravitates to the lower extremities whence it is partly reabsorbed by the local lymphatics *When the left chambers of the* heart are primarily involved as in hypertension aortic insufficiency or mitral stenosis œdema appears and limits itself to the pulmonary regions Facial œdema in cases of heart failure *generally indicates a thrombosis of the jugular vein* or

congestive renal changes as met with in the later stages of cardiac failure Prognosis is usually grave in these conditions

Treatment The treatment of cardiac œdema should aim at reduction of the venous congestion by means of rest, venesection, pleural and abdominal paracentesis careful massage, digitalis, diuretics such as diuretin theocine, novasurol, salyrgan, ammonium chloride, etc, and hydragogue purgatives Diet therapy includes a low protein diet in early cases and a high protein diet in later stages, when œdema is due to loss of an excessive amount of body protein malnutrition sets in In early stages, it is always better to stick to a low protein and a high carbohydrate diet with a limitation in the amount of fluid intake Efficient measures should be adopted early to avoid a later anoxæmia

Nutritional œdema In this condition the protein of the blood serum is decreased The causes are to be sought in a deficient supply to the body of exogenous proteins in the food excessive loss of protein through urine and from bleeding and lastly from non absorption of nutritious materials from the gastro-intestinal tract It is also met with in cases of vitamin deficiency and starvation, in chronic dysentery in chronic tuberculous enteritis in sprue in hookworm infection, in piles, in pernicious anæmia in pregnancy and lactation in diabetes mellitus in chronic alcoholism, in cirrhosis of liver and in cardiac insufficiency These and other factors help in precipitating the condition The ideal treatment in nutritional œdema is to supply an adequate amount of protein in the diet with a restriction in the amount of salt

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Allergic œdema In allergic œdemas, different parts of the body are attacked and symptoms too vary in such cases The treatment in such cases aims at finding the cause of allergy and removing it as far as possible Calcium and adrenalin therapy is useful in these cases A small dose of thyroid alternating with ephedrine is able to control it more effectively

Allergic œd

Renal œdema Here œdema may be generalised all over the body or limited to certain places where loose areolar tissue predominates Oedema is due to the renal damage as seen in cases of acute nephritis, nephrosis and chronic nephritis In acute glomerular nephritis owing to the inflammatory changes in the glomeruli the blood flow through the kidney is greatly reduced resulting in a retention of water, salts and nitrogenous waste products In later stages the plasma proteins are diminished from loss of albumin in the urine and a condition of malnutrition sets in In nephrosis, the œdema is associated with massive albuminuria It is ot always possible to attribute the œdema in these cases to a failure of the kidney o excrete salt or water In such cases factors such as the total amount of serum rotein, the hydrostatic pressure in capillaries and the ability of the kidney to cerete various ions should be considered to explain the causation of œdema The rum protein is always low (being about 4 per cent) in nephrosis a disorder which the kidney also is suffering just as any other part of the body would

Renal œdema

Epstein's treatment of chronic nephrosis—Epstein introduced the high protein t in these diseases to cut short œdema Epstein believes the effect to be partly to the specific dynamic action of the protein, which counteracts the lower l metabolism in this disease, and partly to increase in the

of blood plasma McLean believes that the reduction of œdema is due to diuresis set up the large quantities of urea and other non threshold bodies formed from the high protein diet Renal functional tests should be performed before putting a patient on high protein diet Epstein's diet contains proteins 120 to 240 gm, fats 20 to 40 gm, carbohydrates 150 to 300 gm, giving a total calorific value of 1250 to 2500 Besides this, he allowed 1200 to 1500 c cm of water and enough salt to give a certain amount of taste The articles allowed are lean meat, fish, white of egg, oysters, gelatin, lima beans, lentils, split peas, green peas, mushrooms, rice, oatmeal, bananas, skimmed milk, coffee, tea, cocoa He allowed 2 to 3 gm of protein per kilo of body weight Medicinally, Eppinger advocates extract of thyroid, which induces diuresis in these cases, especially in nephrosis

Neuropathic œdema This type is often associated with disturbed function of the sympathetic system and is seen in different parts of the body Ranvier has shown that the nervous system is responsible for the production of œdema in many cases In paralytic limbs, the absence of muscular activities retards the removal of lymph, resulting in œdema Stimulation of vasodilators also causes œdema The treatment mainly includes physical therapy in the form of massage, electro therapy and splinting to prevent subsequent deformities, etc

Lymphœdema It is seen in cases of filariasis, leprosy, chronic leg ulcers especially those associated with cicatrisation, cellulitis and erysipelas There is also a congenital and familial form of tropho œdema known as Milroy's disease Oedema is often met with after extensive surgical operations, cicatrisation and infiltration may play a part in this

Alkali œdema It is sometimes seen in alkali therapy of diabetes, gastro duodenal ulcers, lober pneumonia etc and disappears on the discontinuance of the alkali Fischer explains it by saying that sodium proteins have a greater affinity for water than calcium or magnesium proteins, and that the sodium salts administered replace the calcium and magnesium in the tissues

Inflammatory œdema Injury to the capillary wall plays an important part in the production of œdema Increased blood pressure, impreded lymph flow, an excessive formation of metabolic products the asphyxiated condition of inflamed tissues which favours acid formation and naturally increases the avidity for water in the tissues are the factors that influence the œdema in these cases Oswald says that the permeability of the vessels for proteins is specifically altered in inflammation so that not only the less viscous albumin and pseudoglobulin pass through, but also the more viscous englobulin and fibrinogen

GENERAL PRINCIPLES OF TREATMENT OF ŒDEMA *Restriction of diet* When œdema has set in control of diet is most important and even in very early cases it may abort an attack Salt and water are the two important œdema producing factors in diet which need careful restriction The daily supply of common salt to dietaries should be cautiously cut down and to satisfy taste potassium chloride may be substituted instead The symptoms of salt deficiency appear only when chloride excretion in urine becomes less than ½ gm per day The symptoms of salt deficiency are vomiting headache, pain in the muscles of the legs and irregularity of the rhythm of the heart Mo[illegible] foods including vegetables contain very small quantities of sodium chlor[illegible] milk, cheese, salted butter, salted fish and preserv[illegible] ain large[illegible] of this salt Restriction of fluid intake depends [illegible] grity of [illegible] If the urine is of high specific gravity th[illegible] water sho[illegible] ouraged to avoid uræmia in the long run The [illegible] too gr[illegible] [illegible] always be borne in mind

Diuretics Water is the best diuretic but in œdema its intake cannot be encouraged Volhard advocates the use of water not exceeding an amount of 1500 c cm in cases of anuric or severe ol guric patients with acute glomerulo nephritis but even this is not generally accepted Of the salts reputed as diuretics sodium salts are contra indicated in œdema and potassium salts are preferable those commonly used are citrate bicarbonate and acetate Strictly speaking chloride of potassium having no influence on the acid base equilibrium should replace all other salts The idea of acidity causing diuresis has led to the use of ammonium chloride and calcium chloride the former acts as a very good diuretic especially in cardiac œdema *Diuretics*

Urea is a very useful diuretic in cardiac œdema and sometimes also in nephrosis It is given in large doses three times a day in combination with a suitable corrective to hide its nauseating taste Before the administrat on of urea tests to prove efficient renal functions should be undertaken Moeller holds that theophyllin by causing an increased transit of fluid and salt from the tissues into the blood stream acts as a diuretic especially when the kidneys are functioning well In cardiac œdema the purines are said to act by their effect on the heart which they stimulate and on the coronary vessels which they dilate Diuretin or the double salicylate of sod um and theobromine is a stronger diuretic than caffeine It has a greater action on the heart and the kidney and a weaker action on the nervous system It is given in doses of 10 gr three times a day with plenty of water Taylor advocates its use up to 90 gr per day to obtain the maximum effect Theophyllin or theocine is a stronger diuretic a more powerful cardiac stimulant and it dilates the coronary vessels better The dose is 3 gr 3 times a day Of the mercurial diuretics the old and famous Guy s pills has not lost its place in the treatment of cardiac œdema Very recently, other prepara *Urea* *Diuretin*
tions c
Becaus
replacc
The m
used ii
impair *Salyrgan*
administration of this drug It can be given either intravenously or intra muscularly in doses of 1 to 2 c cm to be repeated every third day Meyer has
y in cases
peritoneal
rgan into
ole slowly
lamage to
salyrgan
fever and
also been
used as a diuretic in doses of 0 03 gm injected intramuscularly Endocrine products such as extracts of thyroid and parathyroid have also been prescribed for their diuretic effects In cases where due to impaired kidney functions the body cannot get rid of the œdema fluid and is water ogged recourse can be had to other organs to serve the same function *e g* the skin and the bowels Diaphoresis is best effected by means of hot packs electric baths or a simple hot bath It is suggested that the elevation of the temperature of the skin might cause a reflex vasodilatation of the kidneys and thereby bring about diuresis Pilocarpine nitrate is a useful adjuvant in the treatment but it is dangerous in cases of weak heart or œdema of the lung The administrat on of purgatives, *e g*, saline or vegetable, helps a great deal in draining the fluid from the body in

cases of œdema Recourse has to be taken to surgical operations sometimes, when other measures fail Drainage of the pleural, pericardial and peritoneal cavities is essential, under strict surgical precautions It relieves the patient in almost all cases and diuretics are found to act better after such procedures In cases of dropsy of the lower extremeties, the œdema fluid is generally drained by means of *Southey's tubes*
fluid led off by rubb
retained for 24 hou
the limbs, strapping, pressure bandages, etc, considerably help the treatment

63. Oriental Sore. See leishmaniasis, page 353

64. Osteomalacia

This is a chronic disease usually affecting females, characterised by decalcification of bones resulting in bending, fracture and other deformities It is more common in women than in men and occurs usually during pregnancy or when the diet is deficient in calcium and phosphorus Defective hygienic conditions and lack of proper nutrition are said to predispose and the disease is not exclusively limited to the poorer classes In the tropics, the disease is commonly seen in *purdah* women who are debarred from enjoying the beneficial effects of the actinic rays of the sun Fehling draws a relationship between the occurrence of the disease and the ovarian function and in many cases improvement followed oophorectomy Endocrine dysfunction has also been suggested as responsible for
a causative
ciated with
Infective
causes are stated to predispose and in a few cases a severe attack of puerperal, typhoid or scarlet fever, etc, has preceded the development of osteomalacia Repeated pregnancies are also said to predispose The essential pathological changes consist in the absorption of the calcium salts in the affected part of the bones leaving them fibrous and decalcified and new bone is not formed The pelvic bones are markedly affected and are seat of deformity, though other bones such as vertebræ, ribs etc, are also involved The muscles covering the bones degenerate and atrophy The patient often complains of pain of an aching character in the pelvic region, back, chest, etc Tenderness over the affected bones may be present, various deformities of the spine and spontaneous fractures of bones may be also met with Fever, wasting, excessive perspiration and cardiac symptoms may also occur Examination of urine usually reveals an excess of phosphates and calcium salts The disease may run a course of several months and thus become chronic.

TREATMENT Search for all septic foci in the body should be made and eradicated when detected The general hygienic condition of the individual should be improved An open air life and enjoyment of the beneficial effects of sunlight should be advised in these cases The diet is most important and the selection of proper dietary is all that is required in the treatment It should comprise foods rich in calcium phosphorus and vitamins and these are abundantly contained in fresh milk eggs fish meat and fresh vegetables particularly beans peas tomatoes, spinach, etc Vitamin preparations especially containing vitamin D such as radiostoleum, ostelin, codliver oil, halibutliver oil etc should be advocated Parathyroid extract in combination with calcium therapy is of particular value in most cases Physical therapy in the form of ultra violet rays is beneficial in countries where natural sunlight cannot be always obtained Aspirin, salicylates

application of heat and massage are useful for alleviation of pain and cramps Calcium lactate has been advocated in 1 dr doses three times daily with milk The prolonged intake of phosphorus has given encouraging results and this may be given in solution in almond oil (1 in 1000) in daily doses of one tea spoonful after food or phosphorous pill (1 in 100) may be given in doses of 1 or 2 gr three times daily after food Preparations of suprarenal gland have also given good results in some cases If the disease progresses in spite of medicinal treat ment oophorectomy is advised Artificial abortion is justified in earlier months of pregnancy in cases of deformed pelvis with small and narrow outlet and moreover it has been found that pregnancy usually leads to a rap d development of the disease

65 Oxalæmia

[illegible] tion [illegible] of o [illegible] *Defin t on* prote [illegible] do not give rise to oxa c acid [illegible] sugar-containing foods are capable of giving rise to oxalates in the body Intestinal fermentation especially in the presence of tapeworms which contain much glycogen may also lead to the formation of oxalic acid In the treatment of oxalæm a foods containing oxalates are better avo ded and also sugar and articles of diet which are not pure protein such as meat should be restricted Fish is better tolerated in these cases As the liver function is generally sluggish in this condi tion it should be stimulated The alimentary canal should be freed from animal paras tes and metabolism speeded up by respiratory exercises ultra violet rays and oxidising remed es Insulin appears to be the most effective drug in the treatment of oxalæmia

66 Pellagra See page 131

67 Pleurisy

It is not infrequently met with in the course of a large general practice and although many cases are easily dealt with others are liable to cause trouble and anxiety The vast majority of cases of pleural inflammation are undoubtedly infect ve in origin seldom primary apart from tuberculosis but generally secondary to some focal infection of the lungs (tuberculosis pneumonia bronchitis, abscess gangrene embol sm and tumour benign or malignant etc) *Et ology* Certain cases arise (*a*) as a result of direct extension of disease from adjacent organs other than the lung or from abscess of the liver subphren c abscess gastric ulcer serous membranes (pericarditis and peritonitis) (*b*) *via the* blood stream as a part of a general infection (septicæmia pyæmia) (*c*) in the course of infections of undermined orig n (rheumatic fever scarlet fever) (*d*) by the agency either of organ sms or of chemical toxins in chronic disorders of metabolism (gout diabetes chronic nephritis) (*e*) by metastasis from more d stant focal infections (tonsill tis append citis oral sepsis) (*f*) trauma (wounds contusions fracture of ribs) (*g*) from new growths of the lung (*h*) as complications (bronchiectases hydatids etc. (*i*) terminal often in elderly subjects

The most frequent causal agent is the tubercle bacillus Non tuberculous exudative pleurisy which occurs in about 18 per cent of all cases is most fre *Common c* quently due to the pneumococcus or streptococcus A ready clinical classification is discoverable in the nature of the effusion Thus a dry pleurisy connotes a fibrinous exudate a pleurisy with s mple effusion is one that is sero-fibrinous and empyema is one that is definitely purulent.

Acute dry Pleurisy The usual symptoms are pain in the chest aggravated by coughing or attempts at deep breathing with slight or moderate fever The usual cause is Pneumococcus and the characteristic physical sign is a fine friction sound andible over the area affected

Pleurisy with Effusion Tuberculous effusions is very common among those tuberculous patients who are treated with artificial pneumothorax Artificial pneumothorax is seldom followed by pleural effusion in non tuberculous condition In cases of tuberculous effusion *the aspiration should be avoided as far as possible* The development of pleural effusion among tuberculous cases treated with artificial pneumothorax is equally common in cold and worm climates and the incidence does not vary whether the gas is warmed is not *nor which gas is used* The cause of this seem to be (1) Irritation of the pleura with gas, (2) Repeated punctures causing injury of the Pleura, (3) change in the pleura due to separation A small tear in the visceral pleura is a very common cause of effusion

General management Complete rest in bed plenty of fresh air in accordance with the state of the patient, a dose of calomel is administered at the beginning *followed by salts in the morning In the earliest stage, small doses of tincture* of aconite or veratrum viride, 2 min, every quarter of an hour during one hour, afterwards repeating the dose hourly, until the skin begins to act freely and the temperature abates Such remedies should be discontinued as soon as the circulation becomes relieved

Pain (a) *Local applications* Mild cases are relieved by thermogen wool used dry or rendered more potent in action by sprinkling with warm salt water, by the employment of the official cataplasma kaolin Failing this, turpentine or belladonna stupes, or hot linseed meal poultices find some advocates Strapping *the chest, which in former days was normal routine except for cases in which* pain is intense is less to be recommended since it tends to embarrass the sound side prevents effective auscultation, and during removal is apt to cause pain and disturbance to the patient Dry cupping has again come into favour For very intense pain a good procedure is to introduce into the pleural sac a small quantity say 200 c cm of filtered air which by separating the inflamed pleural layers, acts as a cushion and gives instant and complete relief (b) *Drugs* At the beginning, for slight pain, Dover's powder 10 gr is excellent, aspirin 10 gr with or without pyramidon (5 gr) may be given Internally an alkaline diaphoretic and diuretic is of use, *e g* potassium citrate 20 gr, ammonium acetate solution 2 dr, syrup of lemon 1 dr camphor water ½ oz six *hourly If the pain* increases and the patient becomes restless and irritable, it may be necessary to have recourse to veramon 6 gr, by mouth repeated if necessary or to a hypodermic *injection of morphine 1/6 to ¼ gr*

Insomnia If no cause is obvious in mild cases 15 gr each of potassium bromide and chloral hydrate will suffice, in moderate cases allonal one to two tablets or medinal 5 to 10 gr in the worst cases omnopon 1/3 gr orally or hypodermically

Cough This is usually dry, *persistent and ineffective and requires* the [illegible] serine 20 min syrup of lemon 15 min, [illegible] hydrochloride 1/20 gr [illegible] pleurisy resolution [illegible] plaster or blisters or by painting the chest wall with equal parts of [illegible] tincture of iodine Internally a mixture may be prescribed containing the following Potassium

iodide 10 gr, sodium bicarbonate 20 gr, sodium salicylate 10 gr, ammonium carbonate 3 gr, chloroform water up to ½ oz, thrice daily

In acute pleurisy with simple sero-fibrinous effusion, fever, cough and pain may subside after a week or so, and a slight serous exudate becomes absorbed The process may be quickened by painting the chest with iodine or by dry cupping If the exudate does not exceed moderate limits treatment is similar to that for acute dry pleurisy A light diet with limitation of total fluids is advisable the bowels being kept open with concentrated salines Effusion extending above the fourth rib anteriorly if left alone naturally tends to take longer to absorb than those of less amount disappearance of the fluid being accompanied by crackling or creaking friction sounds For many months at the base of the affected lung resonance is impaired, and breath sounds are but feebly audible If after three weeks the fluid level stands at the same height or is increasing particularly above the fourth rib in front or if displacement of organs causes circulatory or respiratory embarrassment after determination of the nature of the fluid by an exploratory puncture, syphonage or aspiration should be undertaken unless the fluid is hæmorrhagic Tapping too low on the left side may damage the spleen causing bad hæmorrhage Needling a solid lung may cause catastrophe In exploring the chest a local anæsthetic should always be used The anæsthetic may be novocaine percaine phenolaine or any other compound The method of withdrawing quantities of fluid with a 20 c cm syringe should not be indulged in some air is bound to enter each time the syringe is removed this air may be troublesome or even a danger later

Usually after the withdrawal of a small quantity of fluid or autoserotherapy absorption begins to take place and the patient may be left alone but in some cases a second tapping may be necessary There are several points in favour of leaving the fluid firstly antibodies may be present in the fluid and secondly the mechanical effect If a lung has been forcibly collapsed with a pressure of fluid it does not expand freely at once if all the fluid is drawn off There are those who suggest that the fluid should be drawn out and replaced by air on the assumption firstly that the fluid is toxic and secondly that the lung should be kept collapsed If the pleural exudate were secondary to pulmonary disease this would be justified on the analogy of the artificial pneumothorax treatment but in most cases the lung does not appear to be diseased at the time of the effusion pulmonary disease not appearing in most cases till some years after the effusion during which time the patient has usually had perfect health Th assumption that air replacement is advisable in all cases would seem to be base on a false analogy Hæmorrhagic effusions are met with in tuberculosis influenz neoplasm and other infected conditions of the pleura and probably the frequen of incidence is in the reverse order to which they are mentioned The ple has strong antibacterial powers for dealing with infection it is on this acco that one so frequently finds that fluids which contain organisms become absor without going on to empyema

68 Pneumonia

It is a disease which affects persons of all ages and stations of life the diagnosis as a rule affords no difficulty the prognosis and treatment ca the greatest skill and judgment In the primary form of the disease the inf is a self limited one Besides natural variation in the virulence of the inf organism the general resistance of the patient plays an important part progress of the disease

The two main types of pneumonia are (1) Croupous or lobar pne 2 lobular or broncho pneumonia Lobar pneumonia may be define

acute infectious disease caused by the pneumococcus of Frankel and locally resulting in an inflammatory consolidation of a large area of the lung The disease is now looked upon as being primarily a form of septicæmia the involvement of the lung being merely a local and predominating manifestation of the infection Recent serological investigations have shown that there are four clearly defined types of infection of which two are common and the type 3 although the most virulent is the rarest In type 4 the disease is said to run rather a mild course In a typical case of pneumonia the diagnosis is not difficult but in children
e
T

inflammation of the capillary or terminal bronchioles and the alveoli which constitute the corresponding pulmonary lobules There are two forms of the disease primary and secondary In the former the pneumococcus is usually found but in the latter the streptococcus, micrococcus catarrhalis and Pfeiffer s bacillus are often predominant a mixed infection indeed is usual Broncho pneumonia is not a self limiting disease like lobar pneumonia and after a variable period the temperature falls by lysis

TREATMENT I *General* Fresh air a minimum of disturbance and adequate nursing are essential The propped up posture usually gives greater comfort Gentle tepid sponging 2 to 4 times a day or as required The diet should contain plenty of fluids, milk citrated and diluted with water imperial drink barley water Horlick s malted milk weak tea etc are given The total milk in the day should not exceed two pints Glucose or lactose may be added to each feed with advantage Oral hygiene is important The mouth should be cleaned with Listerine or weak sodium bicarbonate solution The bowels are kept regular with enema

II *Specific therapy* (*see serum therapy page 559*)

(*a*) *Penicillin* —Penicillin is the drug of choice in pneumonia It should be of 200 000 to 500 000 units three every 24 hours is administered e antibiotics page 648)

(*b*) *Serum Therapy* Fresh interest has recently been aroused in this subject by the use of Felton s concentrated antipneumococcal serum Serum is of value only in types I and II cases which are usually responsible for from half to two thirds or more of the total cases of primary pneumonia It should be given in all severe cases (I and II) seen early in the diseases especially during the first 3 days For therapeutic use the serum is supplied in phials containing 10 000 to 20 000 protein units each of types I and II in a volume of 5 or 10 c cm respectively It is essential that the serum should be *administered intravenously* and in most cases a morning and an evening dose suffice Dose 20 000 to 40 000 units This serum is difficult to prepare and very expensive and uncertain in its effect The dose required costs £ 10 to 20 or about Rs 200

III *Symptomatic treatment* (*a*) Pain Morphine 1/6 to ¼ gr combined with atropine 1/100 gr is given during the first three days of illness to relieve pain It should be avoided in the presence of marked cyanosis or generalised bronchitis with abundant secretion Other measures for the relief of pain consist of the application of antiphlogistine or cataplasma of kaolin (*b*) For cough a

Cough

1 oz is helpful, it loosens the sputum and promotes diuresis and elimination of toxins In later stages and when there is much bronchitis a stimulant expectorant mixture consisting of sodium bicarbonate 10 gr, ammonium carbonate 5 gr, tincture of scilla 10 min, chloroform water 1 oz is given (*c*) To produce sleep give in the early stage, omnopon ⅓ gr or Dover's powder 10 gr, later chloramide and potassium bromide 20 to 30 gr of each, paraldehyde 1 to 2 dr, medinal 6 gr (*d*) Stimulants Digitalis 10 to 15 min of the tincture 6 hourly The early administration of digitalis is a safeguard to the heart The action of strychnine on the respiratory and vasomotor centres makes it a valuable drug in the stage of falling blood pressure, give subcutaneously in doses of 1/60 gr 6 hourly alone or combined with atropine 1/100 gr Adrenaline 0 2 c cm, pituitrin 0 3 c cm may be given intramuscularly when the pulse begins to flag Camphor in oil or cardiazol are very valuable cardiac stimulants Dose 1 c cm every 4 to 6 hours Glucose acts as a stimulant to the exhausted heart muscle in acute failure and may be given intravenously—50 c.cm of a 20 per cent solution with 10 units of insulin subcutaneously and repeated in 12 hours if necessary Alcohol is given when indicated and not as a routine Oxygen is administered with a catheter at the earliest evidence of cyanosis Tonics are indicated during

Stimulan

in strychnine hydrochloride sol

d liver oil may also be given

See page 927

69. Poisoning

General directions (1) In all cases where the poison has been taken by mouth immediately empty out the stomach either by a stomach tube, or emetics The stomach tube is contraindicated in poisoning with corrosives strong alkalies and acids, should be used cautiously in irritant poisoning Emetics should only be used when no means of washing out the stomach are at hand, where poison has been taken immediately after or along with full meals, emetics should first be used followed by a stomach tube. Emetics are also contraindicated in corrosives, strong acids and alkalies, when much diluted they do not act promptly (2) Do not wait for symptoms to appear even in suspected cases, act promptly and wash out the stomach at once (3) Always keep the contents of the stomach and first washings (with plain water) for chemical examination (4) Stomach washings should be thorough and repeated at intervals when symptoms reappear

Principle Treatmen

THE FOLLOWING INSTRUMENTS AND ANTIDOTES SHOULD BE KEPT READY FOR TREATMENT —*Instruments* Stomach tube (this should be inspected frequently as rubber is liable to perish and become unserviceable), mouth gag rubber catheters, hypodermic syringe, tourniquet, scalpels rectal tube and saline apparatus

Emetics Apomorphine hydrochloride 1/10 gr tablets, zinc sulphate 30 gr in 4 oz warm water, copper sulphate 10 gr in 4 oz warm water, mustard ½ oz in 8 oz of tepid water, ipecacuanha wine 6 dr

Stimulants Strychnine hydrochloride 1/30 gr tablets, digitalin 1/100 gr tablets, ether in glass ampoules, adrenaline, brandy, coffee, ammonium carbonate sal volatile

Opiates Morphine hydrocholoride 1/3 gr tablets, tinct of opium 30 min or more

Antidotes Atropine sulphate 1/60 gr tablets, pilocarpine nitrate ½ gr tablets, pituitrin 1 c cm ampoules, amyl nitrite capsules, gold chloride one per cent solution, potassium permanganate crystals; tea, tannic acid, carbonates of sodium and magnesium, olive oil, castor oil, lime water, sulphates of sodium ...tion, ferrous sulphate, tincture of perchloride ..., sodium bicarbonate, dilute sulphuric acid ...ide, chloroform; antivenine, oxygen

Warmth By hot bottles or friction to the extremities

Demulcents Milk, white of egg, barley water, olive oil (avoid in phosphorus and cantharides cases), linseed, tea

Saline injections Normal saline, either by the rectum or sterilised and given intravenously or subcutaneously

ACIDS *Hydrochloric, nitric and sulphuric* Do not use the stomach tube or emetics, but give alkalies, such as calcined magnesia, lime water, if not available give chalk, whiting, sodium carbonate, or potassium carbonate dissolved in plenty of water, magnesium carbonate may also be given dissolved in water or soap and water in large draughts followed by demulcents, opiates and stimulants if required To relieve thirst give pieces of ice or ice cream Rectal feeding to maintain nutrition Tracheotomy may be required to relieve dyspnœa

Carbolic acid Use a soft stomach tube gently and carefully and wash out successively with magnesium sulphate or sodium sulphate ½ oz in a pint of warm water until there is no smell of carbolic acid in the washing Leave some of the solution in the stomach Follow this up by demulcents, stimulants, warmth and artificial respiration Intravenous or rectal saline, if necessary

Oxalic Acid Do not use the stomach tube or emetics, give chalk, whiting or lime with plenty of water Give milk freely and follow with a full dose of castor oil and stimulants

Hydrocyanic acid or cyanides Prompt action essential Place the patient in the fresh air Give adrenaline 4 dr (1 in 1,000) by mouth, empty stomach and ...lphate of iron 20 min of ...esium carbonate Mix ...ion, cold douche (from a height) to head a... 1/15 gr and ether o... If the body surface ... injection of glucose or sodium thiosulphate ...

ALKALIES *Caustic potash, caustic soda, ammonia* Do not use the stomach tube or emetics, but give weak acids, such as vinegar diluted in water or citric acid, tartaric acid lime juice, ½ dr to one pint of water Repeat Followed by demulcents, opiates and stimulants

INORGANIC POISONS *Antimony* Wash out the stomach, give strong tea, tannic acid 30 gr in warm water, repeating as often as vomiting occurs Demulcents stimulants, opiates, warmth Pituitary extract and saline injection if needed

Arsenic Wash out the stomach thoroughly Give freshly prepared ferric oxide (Mix one and a half ounces of tinct ferri perchlor in a wine glass of water with a solution of sodium carbonate ½ oz in half a tumblerful of water, strain the precipitate and administer the precipitate suspended in a glass of water) Repeat, if necessary Demulcents Stimulants Opiates Ice to suck

Warmth to extremities Saline injections or saline per rectum Sodium thiosulphate 5 c cm (10 per cent sol) intravenously

Copper salts Give large quantities of milk and eggs Then wash out the stomach Demulcents opiates and stimulants

Iodine Wash out stomach with a soft tube Sodium bicarbonate 2 dr in half a tumbler of water Starch, bread rice water milk and flour morphine Stimulants *Iod ne*

Lead salts Wash out stomach Give magnesium or sodium sulphate ½ oz in 8 oz of water or dilute sulphuric acid 30 min in 8 oz of water Demulcents Morphia *Lead Sa*

Mercury and its salts Give large quantities of milk and eggs before attempting to wash out the stomach Demulcents Tincture of opium and stimulants Repeat stomach washing and continue it Rectal irrigation with saline mouth wash with astringents Alkaline normal saline intravenously if necessary Sodium thiosulphate 5 c.cm (10 per cent sol) intravenously once every day when acute symptoms subside. *Mercur*

Phosphorus (red paste matches) Wash out the stomach thoroughly with potassium permanganate solution (1 gr to 1 oz) and leave about 10 oz in the stomach or give copper sulphate 2 to 3 gr in 4 oz of water every five minutes until vomiting is induced, then every 15 to 30 minutes and then wash out the stom [illegible] oxide Old Trer [illegible] 15 minutes for [illegible] as a purge Dem [illegible] to combat shock and diminished alkalinity of blood Avoid oils and fats *Phosph*

Silver salts One ounce common salt in 8 oz of water Then wash out and follow with white of egg and milk

Zinc salts Large quantities of milk and white of egg large quantities of sodium or potassium carbonate dissolved in warm water Tannic acid strong tea demulcents and opiates if necessary

ORGANIC POISONS. *Aconite* Wash out stomach with dilute potassium permanganate solution Digitalin 1/100 gr or better 1/50 gr Atropine sulphate and also strychnine Maintain recumbent position Stimulants Artificial respiration Friction Warmth Brandy diluted with water per rectum *Aconite*

Alcohol Wash out stomach Ammonium carbonate 30 gr in 5 oz of water Strong coffee strychnine hydrochloride 1/60 gr Keep the patient roused with cold douches Digitalis Warmth Artificial respiration If required oxygen inhalation *Alcoho*

Antipyrin group (antipyrin antifebrin phenacetin) Wash out stomach Recumbent position Warmth Stimulants. Digitalis Strychnine hydrochloride Artificial respiration If necessary oxygen inhalation

Belladonna atropine datura hyoscine Wash out stomach with dilute potassium permanganate solution Pilocarpine 1/3 gr repeated every two hours until skin becomes moist Stimulants tea coffee tannin Warmth Artificial respiration Catheterise if urine retained If delirium is great give sedatives and ice bag to head *Atrop*

Cannabis indica Wash out stomach with dilute potassium permanganate solution Purgatives Brandy Tannin

an exploratory operation is performed to inspect ovaries of the animals, immediately before the test *The technique of the test* is as follows, 25 c cm of blood which may be withdrawn from the patient at any time, is centrifugalised and the serum shaken with ether A female rabbit weighing not less than 2,300 gm is laparotomized and the ovaries are inspected Then approximately 13 c cm of serum is slowly injected into the marginal vein of the ear If the animal does not tolerate it well, the injection should be interrupted and continued about an hour later Twenty four hours later, the ovaries are inspected and the presence of blood clots indicates pregnancy in the woman from whom the blood specimen was taken

Biochemical test This test is based on the facts that the prehypophyseal hormone increases the cholesterol content of the blood and that the urine of a pregnant woman contains the prehypophyseal hormone The injection of urine of pregnant women into guinea pigs of either sex produces within the first 24 hours an increase of cholesterol in the blood amounting to from 30 to 50 per cent The reaction is positive at various stages of pregnancy In a control series of experiments it was found that urine of non pregnant women did not produce this increase of cholesterol in the blood *The technique* 10 c cm of urine obtained from the fasting patient by catheterization is mixed with 25 c cm of sulphuric ether After the mixture has been shaken and decanted, 10 c cm of it are injected into a guinea pig After 24 hours, blood is withdrawn from the heart of the animal and the cholesterol content of the blood is determined This test of hormone hypercholesterolæmia is considered positive if the blood cholesterol of the guinea pig is increased to 25 per cent The test has several advantages over the Aschheim Zondek reaction The test animal is easier to procure as it may be male or female, sexually mature or immature and of any age or weight The technique is simple and the test can be performed in 24 hours

Chemical test (a) To one c cm of urine add one drop of a 0 5 per cent solution of hydrogen peroxide followed by 5 drops of a 1 per cent aqueous solution of phenyl hydrazine hydrochloride, 5 drops of a 5 per cent aqueous solution of methyl cyanide and 5 drops of concentrated HCl Place the mixture in a water bath for 25 minutes A russet colour and flocculent precipitate denote a positive reaction whilst a negative reaction is indicated by a straw colour and a powdery precipitate or the complete absence of a precipitate (b) A second method said to be more sensitive is as follows To 1 c cm of urine add 1 drop of a 0 5 per cent solution of hydrogen peroxide and allow to stand for 3 minutes Then add 5 drops of 1 per cent solution of phenyl hydrazine hydrochloride followed by 5 drops of a 5 per cent aqueous solution of potassium ferricyanide Allow the mixture to stand at room temperature for ten minutes, next, place it in a boiling water bath for 15 minutes Add 1 drop of concentrated HCl followed by an excess of sodium hydroxide, then titrate with dilute hydrochloric acid until the colour changes from orange through green to blue Much less diluted HCl was required to produce the final colour in pregnancy urine than in the urine of women who were not pregnant The reagents must be fresh

71. Pruritus

It is a subjective sensation of itching The causes are manifold (1) Hysterical pruritus is seen in young girls and also in older women about the menopause Other symptoms of hysteria such as anæsthesia of the soft palate and of the cornea are also evident (2) 'Nervodermite' is seen in the middle aged women and the parts affected are nape of the neck labia perineum and

thighs (3) In psychological cases though pruritus has long ceased, the patient is still under the impression that he or she is suffering from it (4) Senile pruritus (5) Cases of dermographism (6) Toxic pruritus of diabetes gout, hepatic affections, Grave's disease, visceral carcinoma, malaria, nephritis focal sepsis also pruritus due to drugs and food is known (7) A few external causes are (a) Parasitic disease, e g, pediculosis, scabies, ringworm (b) Pruritus ani and vulvæ may be due to worms, portal congestion due to hepatic disease or local obstruction from tumours in the pelvis and from pressure of the uterus in late pregnancy, local fissures or secondary eczema

DIAGNOSIS (1) History (2) Local examination of the part (3) Regions of the body affected (4) Laboratory examination

TREATMENT *General* Investigate the cause and treat accordingly Nerve sedatives are helpful in the nervous group of cases Women nearing the menopause are best treated by radium which accelerates the cessation of menstruation In toxic cases, remove the cause first Investigate if there is intestinal stasis and if so treat by the combined fast and purge method (preferably with the salines) Eradicate septic foci in the body If an allergic state is suspected do a Walker s food test and correct dietetic errors If no definite cause is ascertained try symptomatic treatment with soothing lotions and other general sedatives *Treat*

Local Application of hot compresses followed by dusting inert powders Soothing lotions e g, carbolic acid (1 to 2 per cent) dilute hydrocyanic acid used as lotion or ointment, 1 to 3 per cent of camphor in oil, 1 to 10 per cent menthol as ointment, 10 per cent Bayer s cycloform ointment, 1 to 3 per cent ichthyol may be added to the above lotions or ointment *Local*

A useful prescription is, carbolic acid (1 in 80) 1 oz. liq carb detergens (1 to 6 per cent) 15 min Spa treatment, if available, is very beneficial in some cases Regulation of habits should form a part of the treatment Calcium and parathyroid are very useful in many cases and particularly in those of dermographism Adrenaline is also useful in such cases for temporary alleviation

Antihistaminic drugs Antihistaminic drugs both local application and general administration in the form of tablets are now a-days almost specific in allergic causes Antistine, Benadryl Anthisan are drugs of choice

72. Pyorrhœa Alveolaris

It is a disease characterised by a progressive inflammation and ulceration commencing at the gum margin and invading the periodontal membrane There are various methods of treating pyorrhœa which should be used in combination with full co operation of the patient The methods usually employed are (1) Scaling of the teeth to remove all tartar especially that adherent to the [illegible] *Meth Treat*

[illegible]

This should be done for a few minutes twice a day for about 3 weeks at least after the scaling It may then be replaced by a solution of salt water, a tea [illegible]

The patient should brush his teeth at least twice a day (morning and night) and rinse the mouth thoroughly after each meal

GENERAL TREATMENT (*a*) *Regulation of the bowels* (*b*) *tonics* (*c*) sufficient fruits in diet

VACCINE THERAPY It has little if any value in the treatment of pyorrhœa

73 Quinsy See page 1219 (under sore throat)

74 Rabies See page 886

75 Refrigeration

Refrigeration or thermosteresis is the process of abstracting heat or of making or keeping cool when carried to its limit congelation or freezing ensues The milder degrees are produced through the action of water of varying degrees of low temperature applied in various ways In more intense forms of refrigeration —congelation or freezing—volatile liquids like ether ethyl chloride etc or of carbon dioxide snow or liquid air are used Local freezing causes an occlusion of blood vessels with subsequent anæmia necrosis and atrophy of the epithelium in proportion to the intensity of the application

Liquid air Dried and purified atmospheric air is liquefied by repeated compression (at a pressure up to 2 000 pounds per square inch) and a cooling device The temperature of the liquid air is—422 5°F (—252 5°C) It is marketed in what is called Dewar bulb a flask so blown that one flask is inside another with a vacuum between Liquid air is applied by means of pledgets of absorbent cotton wrapped around wooden applicators In very small lesions a larger surface than would otherwise be necessary must be frozen because very small pledgets would not hold enough liquid

Carbon dioxide snow The carbonic acid gas is liquefied under pressure
(900 pour fy
ing air °F
(−31°C ed
Hubbard the
snow is the
fingers are protected by chamois or leather gloves

If liquid air could always be obtained it would be prepared because of the ease of its application the rapidity of its action and its comparative painlessness The uncertainty of the supply and its high cost make the use of liquid air almost prohibitive The advantages of carbon dioxide snow are it can be easily obtained it can be used on small lesions as unlike liquid air no larger surface than is necessary need be frozen as the mass or crayon of snow may be pared down to any size

The indication for the use of carbon dioxide snow (1) to produce simple
nterstitial
freezing
sefulness
heliomata
pillomata

76 Respiration

The number of respirations in the resting adult is commonly about 17 or 18 per minute This is influenced by various conditions of the body and also

by age A new born child breathes about 14 times a minute, a child of five about 26 times, a man of twenty five about 16, and of fifty about 18 The frequency is increased by any muscular effort even that of standing

When breathing quickly, a man takes in and gives out at each breath about 500 c cm of air measured dry and at O°C (*tidal air*) By means of a forcible inspiratory effort about 1500 c cm of air can be taken in (*complemental air*) At the end of a normal expiration a forcible contraction of the respiratory muscle will drive out about 1500 c.cm more (*supplemental air*) *Vital capacity* is the sum of these three amounts and, is, on an average, about 3500 c cm, i e, it is the maximum amount of air that can be inspired after a powerful expiration. The *residual air* is the air which remains in the lungs after maximal expiration It amounts to about 1,000 to 1,500 c cm *Alveolar air* does not refer to the air which is present in the anatomical alveoli, but is used to describe the air in the depths of the lungs, which is more or less in contact with the respiratory epithelium and can thus carry out gaseous interchanges with the blood It is a physiological entity and consists of the supplemental air, and the residual air and amounts to about 3 000 c cm *The dead space air* is found in the air passages nasopharynx, trachea and bronchi It does not carry out any interchange with the blood, and amounts to about 150 c cm The volume of the physiological dead space is not constant but varies with the alterations in the state of the bronchial musculature and is increased in exercise

Intrathoracic pressure The pressure in the pleural cavity is subatmospheric and is 5 mm Hg during expiration, 10 mm Hg during inspiration The pressure in the lungs is about 1 atmosphere as they are in free communication with the outside air The negative pressure in the thorax is diminished by any factor decreasing the elasticity of the lung tissue Thus, in an old man, where the elastic tissue is degenerated, the alveoli are enlarged, giving rise to a condition known as *emphysema* *Emphysema*

Chemistry of respiration As a result of the oxidation processes associated with life and activity the tissues of a man of 70 kilo body weight consume on an average during working hours about 400 c cm oxygen per minute The tissues produce a large amount of carbon dioxide The oxygen required by the tissues is taken from the blood and the CO_2 formed is in return passed out in the blood Hence the venous blood contains more CO_2 In the passage through the lungs the blood is arterialised, oxygen passing into it and CO_2 out owing to an exchange with the air in the alveoli The composition of the inspired and expired air compares as follows:

	Inspired air	Expired air
Oxygen	20 05 vol per cent	16 4 vol per cent
Nitrogen (including argon)	79 01 „ „	79 5 „ „
Carbon-dioxide .	0 04 „ „	4 1 „ „

Under normal circumstances, inspired air contains a variable amount of aqueous vapour and has a variable temperature Expired air is nearly saturated with aqueous vapour and in the trachea has approximately the temperature of the body 37°C. The tension of aqueous vapour amounts to 47 mm Hg The oxygen tension of the alveolar air is 100 mm Hg and of CO_2 40 mm Hg

By respiratory quotient is meant the ratio of CO_2 evolved to O_2 absorbed and its absolute amount depends on the nature of food stuffs or constituents of the body which are undergoing oxidation If these were entirely carbohydrate the *respiratory quotient* (R Q) would be 1 If fat alone were being utilised it would be 0 71, with protein alone 0 81 In man on a mixed diet, the R Q at rest is somewhere about 0 85 The R Q is affected when the pulmonary ventila tion is altered either voluntarily or secondarily to a rise of body temperature or fluctuation of the H ion concentration of blood (1) *Voluntary hyperpnœa* washes out excessive CO_2 and R Q may rise above one (2) In *acidœmia*, there is [illegible] and the R Q = [illegible] The same applies to the rise of body temperature

is depressed CO_2 is retained in the body and

exercise, lactic acid enters the blood stream and breaks up the plasma $NaHCO_3$ and liberates large additional volumes of CO_2, the R Q *then exceeds 2*

Artificial respiration Under various conditions the respiratory move ments may stop and it may then be necessary to cause air to enter the lungs by some artificial means The most controllable method by which air may be forced in and drawn out of the lungs at suitable intervals is by means of air pumps but when these cannot be used, quite efficient ventilation can be maintained by simpler means The best method in man, is that described by Sharpey Schafer The subject is placed in the prone position, with the head slightly to one side the mouth is cleared and the tongue pulled well forward The operator, kneel ing either at the side or astride, places the palms of his hands flat on the subject s *trunk just over or below the lowest ribs and then by leaning forward presses* gently forwards and upwards for about two seconds He then leans back a little to release the pressure for two seconds and repeats In this way air is forced in and out and it is possible to maintain normal ventilation in an un conscious subject for long periods without undue fatigue on the part of the operator

With patients under an anæsthetic for surgical operation and lying in the supine position, quite good results can be obtained by applying intermittent pressure on the epigastrium, by which means also the diaphragm is made to ascend It cannot be too strongly insisted that pressure on the upper ribs is almost useless In both of these methods, where possible, the subject is made to inhale a mixture of oxygen and 7 per cent carbon dioxide for the stimulation of the respiratory centre

Respiratory efficiency tests The tests are difficult and complicated owing to close relationship of the cardiovascular and respiratory systems These are of *value in determining whether apparently healthy children or adults are up to the* normal standard, whether young adults are fit for occupations involving a special strain on the respiratory organs such as flying, the strenuous exercises of athletes etc These tests also reveal diseases of the lungs and ascertain the degree of pulmonary damage in doubtful cases The tests also determine whether persons are fit to stand operations on the chest or elsewhere in the body *The vital capacity test* This measures the maximum volume of air which is breathed out after a full inspiration Thackrah examined the capacity of the lungs by using a large graduated glass jar inverted over and filled with water The person tested blew through a tube, the lower end of which was immersed in water under the jar The largest vital capacity measured was 6 150 c cm , the average for healthy men ranged from *3,600 to 6 000 c.cm and for females about 2 160 c cm* Hutchinson using his spirometer, showed that the vital capacity is closely related to the standing height and modified by weight and age A relationship also has been

brought out between vital capacity and the surface area of the body, the average for healthy males being 2 660 c cm per square metre of body surface It is
... per cent of the normal
... al healthy athletes give
... nimum being 5,750 and
... 0 c.cm as the average
... wered in diseases of the
lungs and pleura and when the readings are normal, pathological changes in the lungs are usually not suspected The degree of diminution of the vital capacity in pulmonary tuberculosis depends upon the activity of the disease rather than upon the extent of the lesion Hutchison found that the vital capacity in the early stage of pulmonary tuberculosis is on an average 78 per cent of the normal and in advanced stages about 38 per cent and extensive pleural adhesions were not found to lower the vital capacity The vital capacity is lowered in pleural effusion, lung abscess (16 per cent), bronchiectasis (36 per cent), asthma (34 per cent), carcinoma of lung (50 per cent), chronic bronchitis (32 per cent), pneumothorax and cardiac enlargement (41 per cent) *The manometer test* Hutchison measured both the expiratory and inspiratory force of breathing by this test The manometer is attached to the nose of the individual breathing in and out of the apparatus and displacing a column of mercury The test is usually performed with the person tested sitting with the nose slipped and the height of the mercury column blown is noted The abdominal muscles take part in the *Monometer*
test ... found to be 51 mm and the expiratory
to ... average expiratory figure for a fit
fly ... e figure of athletes is found to be
78 ... clue as to the presence of diseases
suc ... pneumothorax. *The endurance or "Fatigue test"* Flack devised this test where the person tested blows up a column of mercury to a height of 40 mm and sustains it there with the breath held as *Fatigue te* long as possible The pulse rate is recorded every 5 seconds during the test The test determines the efficiency of the expiratory muscles and the pulmonary circulation Flack found that in a fit flying officer the column is sustained for 30 to 60 seconds and the pulse rate varies very little during the test The average sustenance time was found to be only 33 seconds The figure however varies with individual cases In respiratory diseases such as pulmonary tuberculosis bronchitis emphysema bronchiectasis, asthma and pneumothorax the sustenance time is lower than the normal figures Strictly speaking the test is not of particular value as a respiratory efficiency test *Bronchial spirometry* has been unsuccessful because of its technical difficulties Bluhm in measuring respiratory *Bronchial* efficiency has considered both basal metabolic rate and blood circulation through *Spirometr* the lungs, the latter is only affected when there is gross destruction of pulmonary tissue and not by pneumothorax or thoracoplasty The working test for pulmonary efficiency depends on the comparison of oxygen consumption after the performance of a standard amount of work The subject of the experiment ascends flights of steps placed in a circle for 20 rounds the rate of walking being fixed by a metronome at 88 steps a minute The relative oxygen debt (Hill) is equivalent to the increase per minute in oxygen consumption following the period of work Normal persons sometimes show little or no increase, but most results lie between 10 and 25 per cent The test cannot be used for people who are confined to bed

77 ...

... fever, pain in the joints and
... the dreaded diseases specially

of temperate climates and is rare in the tropics The occurrence of the disease in the tropics is disputed though The disease has been found to exist ic and choreic The articular form of The essential cause of the disease is obscure though it is an old recognised one and has been described by Sydenham as far back as the seventeenth century It was not until the year 1816 that the modern conception of the pathology of acute *rheumatism was brought to light* Later on it was recognised that rheumatism was essentially a disease of childhood and girls are slightly more susceptible than boys There is a well marked family incidence, but the most important known factor is environment, as acute rheumatism is a disease of the relatively poor, cold and damp were the first suggested causal factors Chemical abnormality such as the accumulation of an excess of lactic acid or uric acid in the system has been suggested The bacteriology of the disease started with Mantle's discovery *of a diplococcus in the blood of a rheumatic child and later on Poynton and Payne* after a series of most careful and consistent investigations discovered a diplococcus which was suggested to be the causal organism It has been suggested that the

who believe that they have recovered a virus from cases of rheumatism in children

The onset of the disease is abrupt and acute with a sense of chill and later on a rise of temperature The temperature is usually remittent or intermittent in nature Sweating is generally profuse and has a characteristic acid smell The *urine is scanty, high coloured and presents a trace of albumin on examination* Vague pains are complained of in the muscles and joints and are made worse by exercise and wet weather, and are usually relieved by warmth and sunshine Of the joints affected the knees and ankles are the commonest The affected joints are swollen and red and synovial effusions may appear specially in the large ones The first definite sign of rheumatism in a child is cardiac involvement with a quickened pulse The heart sounds change in character, the first sound at the apex becomes soft, blurred and accompanied by a systolic murmur and the second sound at the base may be intensified As the heart adapts itself to myocardial damage enlargement of the organ of a permanent nature may appear The blood shows considerable leucocytosis, sore throat is a constant accompaniment of the disease A type of secondary anæmia is also seen among the victims

TREATMENT Three great essentials are recognised in the treatment Absolute rest in bed should be enjoined from the onset of the disease to avoid excessive cardiac damage later on The patient should on no account try to make any unnecessary effort or movement In case of severe carditis the rest should be prolonged to months and the return to activity should be carefully graduated The diet should be liquid during the acute stage of the disease and should include milk diluted with water, barley water, fruit juice etc The Imperial drink is very useful during the course of the disease Intake of fluid should be free to compensate the loss of water from the body by sweat and to facilitate the *excretion of the toxin from the system A thorough search should* be made for the detection of septic foci of infection in the body and when detected should be eradicated At the same time the general condition of the patient should be improved Of the reputed drugs salicylic preparations deserve the name of specific remedies The drugs cut short the course of the disease, cause the temperature to come down, lessen the inflammatory reaction of the joints They also lessen the tendency to recurrences and sometimes cause the disease to

abort at an earlier stage The preparation most commonly used is the salicylate of soda It should be given in sufficient quantities and should be evenly distributed in 24 hours To a child of 10 years about 10 gr of sodium salicylate can be safely administered every hour without any untoward symptoms intervening During the regime the child should be at complete rest have a considerable amount of fluid to drink a regular action of the bowels and be given twice as much of the bicarbonate as of the salicylate of sodium to prevent acidosis About 180 gr of sodium salicylate may be safely given to an adult patient in 24 hours The quantity of the drug should be gradually cut down when the pain of the joints diminishes and the temperature comes down There is an additional value in this method of treatment from the point of view of diagnosis for if a patient suffering from acute arthritis with fever does not improve after 48 hours treatment with full doses of salicylates the case is certainly not one of rheumatic fever Salicin is considered to be less depressing and is sometimes recommended for children The old alkaline treatment has been incorporated with the salicylate treatment In the earlier stages of the disease to relieve severe pain and induce sleep nothing is better than the opium preparations Antipyrine and phenacetin should be avoided in children Cases accompanied by hyperpyrexia may be treated by prompt application of a cold pack During the active stage of the disease small blisters may be applied to the precordium and later on iodide of sodium may be given internally The administration of digitalis in cardiac cases is often attended with poor results Strychnine, adrenaline and pituitary may be given if the blood pressure is very low Recently blood transfusion has been advocated

Salicylate

Sedatives

Bee venom has been found to be efficacious in the treatment of chronic rheumatism It can be used in the form of an ointment for local application Salicylic ointment is at first applied to the skin to render it more absorbent and then the ointment containing venom is used The ointment is applied for 8 days stopped for 4 days and continued for a longer period if necessary

Bee venom

During the acute stage of the disease the local treatment of acutely inflamed joints should comprise the use of splints for fixing the joints to ensure absolute rest and later on when the inflammation abates careful massage attended with gentle passive movements should be encouraged The use of the time honoured oil of winter green for massage of these joints should be resorted to Convalescence is generally slow A change of climate rest nourishing diet and tonics should be recommended for a speedy recovery

Cortisone Acetate—The most modern treatment in order to achieve prompt remission satisfactory results have been obtained with cortisone therapy Dosage as follows 1st day upto 400 mgm of cortisone acetate in devided doses 2nd day, 200 mgm until a satisfactory response is obtained then step-wise reduction to 100 mgm or less daily maintenance dose continued for four to eight weeks or longer The natural history of the disease must be taken into account and treatment reinstituted if reactivation of the disease takes place as indicated by signs and symptoms and as return of fever increase in sedimentation rate recurrance of arthralgia and lengthening of the P—R interval

Cortisone Acetate

Clinical Effects—Within 24 hours after the initial dose of cortisone acetate patients usually describe a sense of well being and appear alert instead of ill and toxic Elevated temperature generally become normal within one to four and a half days The appetite usually improves with resultant true weight gains Painful swollen and inflamed joints in most instances become symptom free after three to six days of treatment Tachycardia when present disappears in

minutes and a drop of the sediment is uniformly spread in a thin layer over a clean and dry glass slide Methylene blue or Wright s stain is used to stain the smear A differential count of lymphocytes endothelial cells and polymorpho nuclears may be made as in a blood film Tuberculous effusions are usually non purulent with lymphocytes predominating The bacilli are never detected by ordinary microscopic examination of the smear Culture in Corper s crystal violet potato medium of the sediment of a centrifugalised specimen in a suspected case gives a satisfactory growth of the tubercle bacilli in two weeks to two months Biological test consists in injecting the sediment into the groin of two guinea pigs Guinea pigs develop tuberculosis in one to three months

Characters of the aspirated fluids (1) Clear serous transudate is light yellow or greenish in colour with specific gravity below 1015 and albumin content under 3 per cent The Rivalta reaction is negative and the stained smear of sediment shows few cells mostly endothelial and no bacteria (2) Serofibrinous exudate is yellow in colour and cloudy due to the presence of fibrin with specific gravity above 1018 The Rivalta reaction is positive with albumin content over 3 per cent Microscopical and cultural examinations of the smear and centrifugalised sediment are of importance in these cases Infection with tubercle bacilli is highly *suggestive where lymphocytes predominate and here cultural examination and* animal inoculation of the centrifugalised sed ment are of immense value The presence of an overwhelming number of polymorphonuclears strongly suggests an early pyogenic infection A cultural examination should be undertaken to demonstrate influenza bacilli streptococci pneumococci etc. (3) Purulent fluid Here a Gram stained smear shows pus cells pneumococci streptococci and staphylococci If a direct smear shows no bacteria culture for tubercle bacilli

RARER FLUIDS (1) *Syphilitic fluids* Smears show equal numbers of lymphocytes and endothelial cells The Wassermann reaction is positive on both the fluid and blood (2) *Fluids in hydatid disease* The fluid is clear with proteins less than 1 per cent and specific gravity below 1010 Microscopic demonstration of the typical curved hooklets in the centrifugalised sediment confirms the diagnosis (3) *Chylous fluids* The true form is due to erosion of lymphatic channels by filarial parasites malignant growths tubercle bacilli and Hodgkin s disease The fluid has a smell of fatty foods The pseudochylous fluid is thought to originate from an albuminous degeneration of the endothelium the exact mode of production being unknown and is met with in chronic nephritis tuberculosis and malignant growths It is pure white in colour and has no characteristic smell (4) *Hæmorrhagic fluid* is of rare occurrence and is met with in cases of thoracic aneurisms pulmonary tuberculosis hæmorrhagic diseases and trauma.

SYNOVIAL FLUID *Normal characters* It contains about 50 white cells per c cm with a differential count of polymorphonuclears +5 per cent monocytes +58 per cent macrophages+30 per cent and endothelial cells +3 per cent A few red celels are found in the fluid in recent traumatic cases and the icterus index is over 6

Collection of fluid for examination The skin of the most dependent part of the fluctuating swelling should be thoroughly swabbed with tincture of iod ne to make it aseptic A sterilised 20 c cm record syringe is used to withdraw the fluid A local anæsthetic like ethyl chloride or 1 to 2 per cent novocaine may be used before the puncture is made The fluid is examined for the leucocyte count an icterus index estimation Wassermann reaction estimation of sugar

content, pH estimation and cultural examination. Direct smears do not show tubercle bacilli or gonococci even if the infection is acute

82 Snake-Bite. See page 929

83. Sore-Throat

Diphtheritic cases The diagnostic features are The knee-jerks are liable to disappear and albumin is often present in the urine, these are very early manifestations of the disease The character of the patch should always be observed Frequent throat swabs are to be taken for bacteriological examinations The submaxillary glands are often enlarged on the affected side only while in non-diphtheritic cases they are bilaterally enlarged.

In diphtheritic cases give the patient a mixture containing biniodide of mercury The following is a convenient way of prescribing it Perchloride of mercury 1 gr, potassium iodide 30 gr glycerine 2 dr and water to 8 oz Each ounce of the mixture contains less than 1/8 gr of perchloride of mercury and a tablespoonful is a perfectly safe dose for an adult. The glycerine is added to make the mixture adhere to some extent to the fauces and thus secures a local as well as a constitutional effect The biniodide of mercury is also a very powerful bactericide and is especially inimical to the Klebs Loeffler bacillus For detailed treatment see pages 799 and 1343 *Sore throat in Diphtheria*

Acute tonsillitis The common recognised types are acute catarrhal lacunar and parenchymatous It may be a primary infection or secondary to nasopharyngeal infections The causal organism is generally a hæmolytic streptococcus *Acute Tonsillitis*

TREATMENT Swab both the tonsils all over with tincture of iodine (not Mandle s pigment) Spray the throat with hydrogen peroxide in warm water (1 in 4) or a warm alkaline spray or douche with a Higginson s syringe a solution containing carbolic acid 1 gr sodium bicarbonate 5 gr, and water to 1 oz Internally, sodium salicylate or aspirin 5 gr each may be given every four hours or a powder containing salol 5 gr phenacetin 3 gr may be given every two hours Small doses of aconite often bring the temperature down A useful prescription is tincture of aconite 1 min antipyrin 1 gr caffeine citrate 5 gr and water to 1 oz, one dose to be taken every hour till six have been taken

PERITONSILLAR ABSCESS (Quinsy) Strictly speaking this is a suppuration of the tissue of the soft palate outside the capsule of the tonsil but many of them are actually intratonsillar ones The palate is congested and bulged there is also pain with dysphagia and high temperature *Quinsy*

Treatment It is surgical and indicates evacuation of the pus contained in the abscess

VINCENT'S ANGINA This is an infection of the tonsils by the fusiform bacillus and a spirillum deep ulceration of the tonsils is a marked feature There is sore throat on one or the other side the temperature is not high and the mouth has a characteristic unpleasant fœtor For diagnosis a bacteriological examination of a throat swab is necessary *Vincent's Angina*

Treatment Gargles and throat sprays containing hydrogen peroxide in warm water to which a teaspoonful or two of glycothymoline is added are very useful Local application with a swab of fresh salvarsan or neosalvarsan powders applied 2 to 3 times a day to the ulcerated parts is most beneficial Application of equal

parts of ipecacuanha and Fowler's solution is also useful Local applications of perborate of soda, methylene blue, and trichlor acetic acid are also used For obstinate cases, intravenous injections of neosalvarsan are indicated

Other causes of sore throat are acute septic pharyngitis, hospital sore throat Ludwig's angina, herpes of the pharynx (rare) and pemphigus These are treated on the lines indicated above

84. Sprue. See page 712

85. Sputum

Collection of the specimen As secretions of the nasopharynx and mouth are likely to contaminate the sample, it is desirable as a preliminary measure to cleanse the mouth with some antiseptic lotion It should be coughed up into a sterile wide mouthed bottle and submitted for ordinary microscopical and cultural examinations The sample should be examined within two hours of such collection In case of a child, washings from the fasting stomach may be examined for tubercle bacilli or the child may be induced to cough by tickling the throat and the particle of phlegm may be swabbed off from the posterior pharyngeal wall.

GENERAL CHARACTERS (1) *Amount* In measuring the twenty-four hours' sample the quantity of supernatant saliva and other secretions should be deducted leaving behind the purulent material only From 4 to 20 oz of sputum are expectorated in case of bronchiectasis, discharging abscess and pulmonary tuberculosis with cavity formation As the lesion in the lungs heals up the amount of sputum brought out also decreases but the latter gives no idea of the extent of pulmonary disease (2) *Odour* Ordinarily sputum is odourless It has a very foul offensive smell in cases of lung abscess, bronchiectasis, tuberculous cavities and particularly in gangrene of the lungs (3) *Types* (*a*) Mucoid sputum is transparent and glairy and is met with in most acute pulmonary infections and after attacks of bronchial asthma (*b*) Mucopurulent sputum consists of masses of opaque pus of varying colour, floating in mucus The purulent material is increased and marked in bronchiectasis pulmonary abscess and tuberculous cavities Pus and mucus are intimately mixed in cases of pulmonary abscess (*c*) Distinct purulent sputum is found at the height of acute infections of the r ctasis cases If expectoration of a case of ruptured abscess of the sputum is characteristic in bronchiectasis, lung abscess and gangrene *The topmost layer is one of frothy* pus, the intermediate is of watery mucus and the lowest layer consists of pus (5) *Blood stained sputum* Expectoration of blood stained sputum, though highly suggestive of a grave pulmonary lesion should never be confirmed unless the surrounding regions such as the mouth including the gums nasopharynx, etc are thoroughly investigated The prognosis is usually grave if the amount of blood brought out exceeds one drachm In hæmoptysis, the blood is bright red and frothy and the sputum is tinged with blood for days together even after the cessation of hæmoptysis Microscopical demonstration of tubercle bacilli or a large number of spirilla in sputum confirms the diagnosis Moreover, the sputum will also contain pus in cases of bronchiectasis lung abscess gangrene, etc A radiogram of the chest in these cases also helps the diagnosis considerably In old people carcinoma of the lungs should be borne in mind

MICROSCOPIC EXAMINATION OF SPUTUM The examination of an unstained film under the low power lens of a microscope is important as it gives much valuable

f m t n The film sh o ld b moderatel th ck A drop of str ng ca st c

Microscopic Characters of Sputum

has prognostic importance These indicate damage of pulmonary tissues and are abundantly found in progressive pulmonary tuberculosis ulcerating bronchiectasis, abscess and gangrene The sputum is boiled with an equal volume of 10 per cent sodium hydroxide centrifugalised and the sediment is submitted for microscopical examination *Fungi* such as streptothrix leptothrix, the actinomyces are sometimes accidentally found in the sputum of patients suspected clinically to be suffer resemble those of tuberculosis but the sputum shows no tubercle bacilli The *heart failure cells* are phagocytic histiocytes from the alveolar walls of the lung They are large cells with the nucleus situated eccentrically and containing yellow granules The sputum in these cases is brown due to the presence of pigments hæmatoidin and hæmosiderin They are abundant in pathological cases only such as mitral stenosis and pulmonary infarcts The *dust cells* are found in the brownish black sputum of people living in the dusty atmosphere of big cities These look like

DEMONSTRATION OF TUBERCLE BACILLI Technique of staining a film The smear should be moderately thin Carbol fuchsin should never be boiled but should be heated till it steams The stain is then poured over the slide to cover the smear After three minutes the stain should be washed off with water It is then decolourised with acid alcohol (concentrated hydrochloric acid 3 c cm and alcohol 95 per cent 97 c cm) until it is pinkish gray on washing with water Lœffler s methylene blue is used as a counterstain and kept for half a minute It is then washed with water dried and examined for tubercle bacilli under the oil immersion lens of the microscope Under the microscope the bacilli appear as small red rods a few are curved and others are slightly beaded The presence of bacilli of this nature is diagnostic but in the event of none being seen several smears should be examined When sputum is not available throat swabs and gastric washings should be examined for bacilli

Acid Fast Bacilli

Culture and animal inoculation of sputum for diagnosis of tuberculosis Ordinarily stained smears of sputum do not show tubercle bacilli if these are less than 100 000 per c.cm of sputum whereas the presence of 10 to 100 bacilli per c cm of sputum produces a positive culture for tuberculosis if inoculated into a guinea pig The medium used in cultural methods is 0 5 c cm of sterile citrated blood or 0 5 c cm of fresh egg yolk treated with 6 per cent sulphuric acid The sulphuric acid destroys all bacteria except tubercle bacilli After incubation of sputum at 37°C for 45 minutes the sulphuric acid is neutralised with sterile 1 3 per cent sodium bicarbonate in 3 per cent glycerine The growth is watched at weekly intervals for three weeks till positive culture is obtained A smear of such a culture may be stained with carbol fuchsin to demonstrate tubercle bacilli under the microscope

Culture of Sputum for Tuberculosis

Whooping cough organisms in sputum (early diagnosis) The special culture medium used is the glycerine-potato-blood agar medium of Bordet Gengou with a pH 5 A small Petri dish is held vertically before a child s mouth during a coughing attack The cough should be deep and expulsive Droplet infection of the medium in the Petri dish takes place and the plate is incubated for 48 to 72 hours *Bacillus pertussis* colonies appear as tiny pearls surrounded by dark

Culture for Whooping cough Organisms

zones Under the microscope a smear, when stained shows Gram negative small organisms resembling pneumococci The organisms are generally detected in the catarrhal stage of the disease at a period of greatest infectivity

Vincent s organisms in sputum Collect... chronic pulmonary diseases sputum organisms Thorough aseptic precaut and tonsils should be taken before the collection of the sample and the specimen should in all cases be examined within half an hour of collection The smear should be thin and free of purulent materials It is stained with steaming carbol fuchsin for three minutes The stain is then washed off, dried and the film submitted to microscopical examination The bronchial spirochætes if present, appear as pinkish red organisms Negative findings have no value and even in positive cases contamination from the oral cavity should be borne in mind In pathological cases they are present in numbers as secondary invaders and are commonly met with in chronic bronchopulmonary diseases and pulmonary hæmorrhage

Pyogenic organisms in sputum Gram s stain is used in finding the organisms in acute infections The organisms commonly found are pneumococcus (Gram positive), Friedlander s baci' ... (Gram positive), micrococcus catarrhalis (Gr ... Gram negative), Bordet Gengou bacillus of ... these appear as tiny bacilli resembling influe... bac...

86. Stools

Functional test for gastro intestinal motility The patient swallows a 10 gr capsule of carmine and the stool is watched for a change of colour It should normally become coloured red in 24 to 48 hours and the colour should continue for 48 to 72 hours after taking the carmine capsule

Collection of fæces About half an ounce of formalin should be added to the collected stool to destroy the disagreeable odour For cultural examination and detection of occult blood in the fæces formalin should not be added

GENERAL CHARACTERS *Colour* The normal colour of stools varies from yellow to brown Pale coloured stools indicate poor digestion with deficiency of bile and pancreatic secretions The colour also varies due to intake of different foodstuffs and drugs Tarry coloured stools are found in lesions of the upper gastro-intestinal tract Fæces tinged with fresh red blood indicates a lesion in the lower gut and particularly of the rectum *Form* Normal stools should be semi formed with undigested food particles in them Loose stools indicate deficient absorption of the fluid matter from the fæcal mass in the large intestine or a rapid evacuation of the intestinal contents Narrow and ribbon like stoods indicate a spasmodic condition of the gut Scybalous masses are the result of a spastic condition of the colon *Mucus and pus* A naked eye detection of mucus and pus in the fæces indicates colitis or enteritis In acute diarrhœas mucus is intimately mixed with fæcal matter Pus in stools is usually found in inflammatory conditions of the gut *Chemical tests* *Occult blood* Benzidine acetic acid solution is the reagent ordinarily employed for the test It is prepared by dissolving powdered benzidine in 5 c cm of 50 per cent acetic acid A small portion of the fæces is smeared on the centre of a white paper and a drop of the reagent is poured over it The development of green or blue colour in less than one minute indicates the presence of blood in the stools A deep blue colour within

3 seconds indicates over 5 per cent of blood, a pale blue colour in 3 to 5 seconds indicates 1 to 5 per cent of blood, a pale blue or green colour within 15 to 60 seconds indicates less than 1 per cent of blood and a pale blue colour after 30 seconds is of doubtful value Another most sensitive test to detect occult blood in fæces is to use a saturated solution of benzidine in glacial acetic acid with hydrogen peroxide It is added to a boiled solution of fæces when the blue colour develops The test will give a positive reaction to blood in a dilution of 1 in 3 000 000 Unlike the former test dietary precautions are to be observed in these sensitive techniques as this is likely to yield false results Extragastro intestinal sources of bleeding should be looked for and excluded before a test is done and a diagnosis given Repeated examinations of stools are helpful in these cases to confirm a diagnosis The test is positive in cases of peptic ulcers carcinoma of the gastro intestinal tract ulcerative colitis dysentery typhoid fever intestinal

about 3 to 4 times its volume of mercuric chloride solution is added and the two are mixed with a glass rod The development of red colour denotes hydrobilirubin (urobilin) and a green colour bilirubin The colour generally appears in less than an hour but may require more time if the quantity of bile is small Urobilin the decomposed product of bilirubin is the normal pigment of fæces The test is required to ascertain the amount of bile present in the stools Absence of bile gives rise to bulky, offensive, pale-coloured stools

Microscopic Characters of Stool

MICROSCOPIC EXAMINATION OF STOOLS The smear on a glass slide should be from a fresh specimen and mixed with an equal amount of water The film should be a thin one The objects seen under the microscope are vegetable fibres spirals or cells triple phosphate crystals, connective tissue strands and muscle fibres epithelial cells and leucocytes worms and their ova occasionally amœbæ and flagellates red blood cells and bacteria For details of examination of fæces for intestinal parasites and their ova see page 1384

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INFANT'S STOOLS The following should be noted (1) *Number* More than 4 evacuations should be considered pathological (2) *Colour* Normal colour is brown but infants fed solely on milk have pale yellow or green stools Green stools in diarrhœas indicate that the bile could not undergo a change in the gut (3) *Consistency* It varies and depends on the nature of feeds given to the infant Foamy stool is due to carbohydrate fermentation (4) *Odour* A sour odour is due to carbohydrate fermentation while a foul putrefactive smell indicates protein putrefaction (5) *Curds* The appearance of curds in infant s stools is thought by some to be normal Protein curds are hard tough and leathery fat curds are buttery in consistency (6) *Mucus* It indicates an inflammatory condition of the gut and the amount varies with the severity of the lesion (7) *Blood* Intimately mixed with fæces and associated with loose stools blood is seen in cases of infectious diarrhœa dysentery, ulcer intussusception tuberculosis and scurvy Stools smeared with fresh blood outside indicate a lesion of the rectum such as fissure ulcer, polypus etc

Culture of Stool

CULTURAL EXAMINATION Cultures from fre h specimens only are desirabl Nutrient broth is the medium used for it The pathogenic organisms found are *B dysenteriæ* of Sonne Flexner Hiss, Russell *B paratyphosus* I and C *B morgani paracoli B dysenteriæ, schmitz*, etc

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PARASITES AND THEIR OVA IN THE STOOLS The examination of stools is never complete unless a naked eye examination for a part or whole of a parasite (*e g* tænia and oxyuris) or their larvæ (*e g*, strongyloides) or a microscopical examination for their ova is undertaken In positive cases detection of parasites may be difficult at times but the ova are generally present in all specimens submitted for microscopical examination In anæmic patients particularly, the examination of the stool for parasites and their ova should be a routine procedure *Collection and examination of fæces* The specimen for examination should be collected in a wide mouthed bottle with a little addition of formalin and water The formalin destroys the disagreeable odour and dilution with water helps emulsification of the sample facilitating the detection of ova under the microscope To search for the adult worms, *e g*, tapeworm segments and oxyuris it is advisable to give a dose of salts at night and examine the stools the following morning The liquid stool is poured on to a sieve and water poured on it, the fæcal matter is washed away leaving the worms and undigested residues of food The contents of the sieve are transferred to a black or dark brown dish or simply a large Petri dish with a piece of black paper underneath when the worms if present can be easily picked up *Microscopical examination* To examine stools for ova it is desirable not to administer any purgatives, as ova are better demonstrated in formed stools than liquid one *Simple smear* A thin smear of stool is made on a clean dry glass slide and the whole area is examined under the low power lens of the microscope Ova and larvæ are seen, when these are present in overwhelming numbers

McVail's method The method is generally adopted for hookworm ova A thick smear of stool with water is made on a glass slide and left for five minutes The whole is then gently immersed in a bowl of water The floating coarse particles and debris are washed away, leaving the ova on the slide

Willis method About half a gramme of fæces is poured in a small tin container and a thorough emulsion of it is made with saturated salt solution The container is filled to its brim with salt solution and a clean glass slide is put over it in contact with the stool emulsion for nearly ten minutes The slide is rapidly lifted up and then examined under the low power focussing on the upper surface of the film and not on the slide Almost all nematode ova (excepting unfertilised ascaris ova) float in saturated salt solution and hence are present in the film on the slide This method is not useful for detecting strongyloides larvæ unfertilised ascaris ova and ova of flukes and tapeworms

Rivas method About 2 gm of stool is emulsified in 10 c cm of 5 per cent acetic acid solution The homogenous suspension is allowed to settle for two minutes 5 c cm of the supernatent fluid is removed with a pipette and an equal quantity of ether is added to it It is then centrifugalised Four layers of ethereal extract detritus acetic acid and sediment are formed in succession The layers of ether, detritus and acetic acid are carefully poured off and the sediment at the bottom of the tube is submitted for microscopical examination

Direct Centrifugal Floatation or D C F method This delicate method has been devised by Clayton Lane to detect hookworm and other ova which float in saturated salt solution and is of special value for diagnosing mild infections The stool is first emulsified in water and centrifuged Saturated salt solution is then added to the sediment and the tube filled to the brim with the solution A special square cover glass is placed on the top
is held in place by four horns of the
tube is centrifuged again at high speed

on a slide on two little plasticine cones with the film side downwards like a hanging drop preparation and is examined under the low power of the microscope

87. Sudden Deaths

Apart from sudden deaths after violence, accidents and poisoning the statistics of the different pathologists of the world show that the majority of accidents is due to sudden stoppage of the heart, profuse hæmorrhage from various causes and arterial embolism and thrombosis in different parts of the body Of the diseases of the ... ves, atheroma of t ... dial fibrosis, fatty ... of the aorta, both ruptured and unruptured, account for a large number of cases Respiratory diseases including hæmoptysis in pulmonary tuberculosis cancer of the lung, obstruction of air passages due to foreign body, diseases like diphtheria, malignant growths like carcinoma, pneumonia, pulmonary embolism are responsible for others Other common causes include intracranial hæmorrhage, intracerebral hæmorrhage, tumours of the brain, œdema of the brain, ruptured cerebral aneurism, brain abscesses, cerebral embolism, acute infections and septicæmia, heat stroke, heat exhaustion, operative shock, allergic and anaphylactic shock, deaths during anæthesia, abdominal emergencies such as perforated peptic ulcers and perforated appendix with peritonitis, obstruction, etc

Sudden Dea

88. Systemic Diseases, Oral Manifestations of

The oral cavity serves as an index of generalised infection of the body The altered character of the oral mucosa from the normal pink colour to a general pallor is strongly suggestive of anæmia Similarly, a purplish colouration of the mucous membranes, particularly of the lips and tongue strongly suggests an ...

Colour cha of mucosa

tion who are popularly known as mouth breathers Brownish pigmentation of the oral mucosa is seen in Addison's disease Ulcerations, exudations and deposits on the gums, tongue and elsewhere often appear as local manifestations of general infections, toxæmias, chemical poisoning, dietary deficiencies or serious diseases of the hæmopoietic organs

asso ...
tong ...
usua ...

Tongue

... the mouth The papillæ of the tongue become more prominent and an exudate is usually found in the faucial tonsils in follicular tonsilitis, scarlet fever, etc In Vincent's angina, a punched out ulcer with a dirty exudate around the tonsil is seen with tender ...

Many diseases ...
lichen planus, lup ...
angioneurotic œdem ...
patches on the tongue or lips suggest lichen planus Lupus erythematosus appears as greyish or reddish spots or patches which may ulcerate Pemphigus of obscure

Oral manif tion in Skin Diseases

origin occurs as blebs and ulcers on the mucous membranes and resists all treatment with a tendency to frequent recurrences In measles Koplik s spots usually appear first in the mouth as small bluish white spots each on a red base later becoming whitish and numerous

The salicylates and their derivatives barbituric acid compounds phenol phthalein potassium iodide all produce rashes involving the mucous membrane of the mouth Benzol bismuth lead and mercury cause characteristic intraoral changes Lead produces a bluish deposit on the gums Bismuth and mercury produce severe stomatitis with violet or black pigmentation and later ulceration

In Endocrine dysfunctions Intraoral changes are chiefly associated with endocrine dysfunctions such as hypothyroidism and Addison s disease In the former the tongue is thickened and in the latter, pigmented areas are seen on the oral musosa

In deficiency diseases marked changes are met with in the oral cavity In scurvy the gums become hypertrophied and soft and often bleed considerably a sore tongue with atrophy of papillæ and redness is characteristic of pellagra swelling and multiple superficial ulcerations appear later simulating those of pernicious anæmia

Pernicious anæmia shows pallor of mucous membranes of the oral cavity and tongue In tropical sprue the tendency to ulceration and atrophy of the tongue is more marked Polycythæmia is evidenced by cyanosis of the lips and tongue Bleeding and swollen gums resembling scurvy are seen in purpura A general anæmia of the oral mucosa and hæmorrhage from the gums appear as early signs in fatal leukæmias

89 Tetanus

Tetanus or lockjaw is a specific disease caused by the toxins of the tetanus bacillus an anœrobic organism The bacilli occur in the intestines of animals such as the horse and cow Man is infected through a wound contaminated with soil containing the spores The bacilli remain localised but give rise to exotoxins These are absorbed from the end plates of motor nerves and pass up through the perineural lymphatics The incubation period is about 12 days but may be as short as 2 days or prolonged to several months

Diagnosis (1) History of wound (2) Clinically trismus stiffness opisthotonus spasms etc are characteristic in a typical case The mind remains clear and the patient is in great agony It is easily differentiated from strychnine poisoning in which the jaw and neck are not affected there is complete relaxation between spasms and the body temperature is normal (3) Moderate leucocytosis (4) Cerebrospinal fluid comes out under pressure

TREATMENT (1) The patient is kept in a dark and quiet place (2) Anti tetanic serum is given early desensitising the patient if necessary (see also serum therapy page 557) An intravenous injection of 20 000 units diluted with an equal volume of warm normal saline is given slowly A lumbar puncture is then made under general anæsthesia and 20 000 units of concentrated serum is given intramuscularly and repeated if necessary (3) Chloretone 40 gr olive oil 1 oz may be given per rectum Chloral hydrate 15 gr and potassium bromide 20 gr given 4 hourly by mouth when the patient can swallow (4) Chloroform is administered if spasms are severe (5) One c cm of 25 per cent solution of magnesium sulphate per 25 lb body weight given intrathecally sometimes produces good results (6) Rectal saline and glucose

Prophylaxis Serum in doses of 500 units subcutaneously or intramuscularly repeated three times at weekly intervals

Curare treatment The chief effect of curare is to paralyse the voluntary movement by blocking the passage of impulses from the peripheral nerves to the muscles Along with the antitoxin treatment and the administration of sedative drugs *per rectum* such as paraldehyde avertin etc., dose of 32 mgm of the drug for adults is injected subcutaneously and is generally repeated at six hourly intervals In severe cases four such doses would bring about an improvement in the condition clinically but repetition of treatment might be necessary on recurrence of symptoms No unpleasant symptoms or serious after-effects follow these injections Observations on the effects of curare treatment in tetanus are hopeful but dosage at present is a difficult problem and will remain so until a standardised preparation of the drug is available *Curare*

90 Tuberculosis See page 786

91 Typhoid Fever See page 742

92 Urine

The examination of the urine may give important information concerning disturbances of metabolism as well as regarding diseases of the kidney or urinary passages and even with regard to functional abnormalities of the liver, or of the heart and circulation

The examination of the urine should include the following —

The volume excreted per day the specific gravity the colour and the reaction In addition it should be tested for the presence of albumin and sugar (cloudy urine must be filtered before these tests are made) Urine which contains pus cells or bacteria is usually turbid and sometimes cannot be cleared by filtration Under these conditions it must be shaken with kaolin and then filtered According to its colour the urine should be tested for the presence of bile pigments, blood pigments urobilin and porphyrin Finally the urinary sediment should be examined microscopically In certain cases the examination must include tests for other substances (*e g* in diabetes for acetone and di acetic acid) and the quantitative estimation of albumin sugar nitrogen etc

VOLUME The norm l m le ds approximately 1500 to 2000 c cm per day A daily volume of less than 500 or more than d as abnormal *Volume*

the urine is excreted principally during the day and only a small quantity at night it is often observed in patients with heart disease pyelitis or vascular disease of the kidneys that a far larger amount of urine is excreted during the night (nycturia)

SPECIFIC GRAVITY It is measured by dipping a dry hydrometer into the *urine cooled to room temperature The hydrometer is read at the lower level of* the fluid meniscus The specific gravity is dependent upon the amount and the weight of *Sp gr*

The

approxim

of low sp

able loss of water in the form of perspiration during vigorous exercise or via the bowel in diarrhœa small quantities of urine are passed having a high specific gravity

From the specific gravity of the urine the total concentration of solids in grammes may be calculated by pecific gravity by Haeser's coefficient 2 3 1 015 contains 34 5 (15×2 3) gm solu volume of 2 000 c cm, represents the elimination of 69 0 gm of solids per day

COLOUR. The colour of the urine which is normally yellow, is fainter with a dilute urine, and darker and more reddish yellow, if the urine is more con centrated Bright yellow urine of high specific gravity is often found with diabetes mellitus The urine is a dark, yellow brown (the colour of beer) and has a yellow foam if bilirubin be present, *i e*, with icterus, reddish yellow or reddish brown if it contains urobilin a reddish colour with porphyrinuria, a smoky red, *i e* red and at the same time slightly cloudy and iridescent, if blood be present therein The *original colour of the urine deepens somewhat upon standing in* air and may change to a greenish brown following the use of phenol, lysol naphthol, hydroquinine, salol, or with alkaptonuria or melanuria

REACTION The reaction of the normal freshly voided, human urine is acid principally due to the presence of disodium acid phosphate Occasionally the reaction of the normal urine may be amphoteric changing blue litmus fainly red and red faintly blue This is the case if large quantities of the dibasic phosphates are present together with acid phosphates When only the dibasic phosphates, or with these tribasic phosphates are present the reaction is alkaline

ALBUMIN Albumin may be demonstrated in the urine by the following tests (turbid urine must be filtered before tesaing)

1 *Heat and acid* *The urine is heated in a test tube to boiling and one or* more drops of dilute acetic acid are then added (instead of dilute acetic, con centrated nitric acid may be used) If a preciptate develops during heating which disppears on addition of the acid, it is composed not of albumin but of the phosphates or carbonates of calcium or magnesium which are easily soluble in acid If there remain even a slight clouding, or if such appears for the first time upon the addition of acid, albumin is present If the urine is very dilute or poor in salt the addition of a small amount of salt greatly enhances the accuracy of the test For estimation of the albumin content the Esbach albuminometer may be employed This method is complicated by the fact that Esbach's reagent (picric acid and citric acid) may sometimes cause a precipitate in normal albumin free urine, since the picric acid produces an insoluble compound with potassium salts, urates quinine urotropin and other substances A ... the Esbach method ma give too high a value following the use of u reaction in urine that contains no acids The this difficulty 1 5 gm phosphotungstic acid di concentrated HCl and 95 c cm of 95 per cent alcohol

2 *Heller's test* Concentrated nitric acid is layered beneath the urine in a test tube by means of a pipette *In the presence of albumin there develops* at the boundary between the two fluids a cloudy ring

3 *Sulpho salicylic acid test* If 20 per cent sulpho salicylic acid be added to the urine there develops a definite clouding with small traces of albumin

ALBUMOSE Albumoses appear in the urine in many febrile infectious diseases (febrile albumosuria), in some types of poisoning (*e g*, phosphorus poisoning), also in the presence of a purulent exudate as in empyema, meningitis

Albumose

ing the urine with crystals of ammonium sulphate boiling and filtering The precipitate on the filter paper is washed with water when any albumose will be redissolved and carried through the filter paper The Biuret test is then applied to this filtrate and if positive indicates the presence of albumoses With

to cool

SUGAR 1 *Fehling's test* For this test two component solutions are prepared (*a*) 34 64 gm crystalline copper sulphate dissolved in water and diluted to 500 c cm (*b*) 173 gm of Rochelle salt (potassium sodium tartrate) and 100 c cm of pure sodium hydroxide diluted to 500 c cm with water These two solutions are mixed in equal proportions before using One c cm of the mixture should be completely reduced by 0 005 gm of glucose Two c cm of this mixture are placed in a test tube diluted with an equal volume of water and boiled In the absence of contamination no evidence of reduction should appear One or two c cm of urine are added to the tube and the mixture is heated on a water bath In the presence of glucose there appears a reddish yellow precipitate of cuprous oxide

Sugar

The quantitative determination of the urinary sugar by Fehling s method is carried out as follows 10 c cm of Fehling s solution 10 c cm of concentrated sodium hydroxide and about 50 c cm of water are mixed in a basin The urine is then added gradually from a burette until the blue colour of cupric oxide has completely disappeared The percentage content of sugar is then calculated from the fact that the volume of urine added must have contained 0 05 gm of glucose If the sugar content is known to be high it is sometimes better to dilute the urine to 1 to 10

2 *Benedict's test* To about 5 c cm of the reagent in a test tube add 8 to 10 drops (no more) of urine boil the mixture for 2 minutes and allow to cool Dependent upon the amount of glucose present the mixture turns green or a green yellow, or red precipitate appears

DIACETIC ACID In the presence of diacetic acid the urine gives a positive reaction to Gerhardt s ferr c chlor de test The ... with (even acetic olour sitive d by

Diacet c ac

diacetic acid alone but also by antipyrin and certain other drugs as well as by amino acids with this difference however that the diacetic acid containing urine also gives a positive test for acetone Sal cylic acid produces a violet colour with ferric chloride

If the patient has been taking drugs such as aspirin salicylic acid or salicylates etc misleading results may be obtained The colour is however, quite different from that given by diacetic acid since it is much darker and of a more violet hue To differentiate this, bring the urine to the boiling point If the reaction

is due to diacetic acid the heat will decompose the diacetic acid and the port wine colour will disappear If it is due to coal tar drugs the colour will persist

ACETONE *Rothera's test* Take about 2 inches depth of urine in a test tube and saturate it by shaking with finely ground ammonium sulphate crystals To the solution add a few drops of a recently prepared 10 per cent sodium nitroprusside solution and about as much ammonium hydrate as the amount of urine taken The production of a permanganate colour at the junction of the fluids indicates the presence of acetone

PUS On adding liquor potassæ, a ropy gelatinous mass indicates pus (The microscopic test is better)

INDICAN To some urine add an equal amount of strong hydrochloric acid, then a few drops of hydrogen peroxide Shake up the mixture with some chloroform The indican is oxidized to indigo which imparts a blue colour to the chloroform

BILE SALTS. Hay's test—Sprinkle flowers of sulphur on to the surface of urine in a test tube If bile salts be present the particles of sulphur sink to the bottom of the tube

BILE PIGMENTS Bilirubin is identified by Gmelin's test Below the urine in a test tube is layered a small amount of fuming nitric acid At the interface between the two solutions in the presence of bilirubin, there is formed a ring of colour which changes from green through violet to red and finally yellow A blue ring may be caused by the presence of indigo, and a reddish brown ring by urobilin and other substances Gmelin s test may be carried out in another fashion If the urine is filtered the greater part of the bile pigments remain upon the filter paper If upon this yellowish filter paper is placed a small drop of *nitric acid the characteristic rings of colour form about it* Or several drops of urine may be placed upon an unglazed, porcelain plate and touched with a rod dipped in nitric acid

UROBILIN It is demonstrated in the urine as follows —

The urine is mixed with an equal volume of Schelsinger s reagent (zinc acetate 10 gm alcohol 100 c cm) The turbid mixture is then shaken and filtered In the presence of urobilin the filtrate shows a green flourescence (best seen by looking down the test tube against a dark background) This test may be rendered more sensitive by mixing 3 drops of a 5 per cent alcoholic solution of iodine with 10 c cm urine to convert all the urobilinogen to urobilin before the addition of the Schlesinger's reagent Upon spectroscopic examination urobilin containing urine shows a single absorption band between the green and blue sometimes only after the addition of zinc chloride and ammonia

Diazo reaction Solution A Saturated solution of sulphanilic acid in 5 per cent HCl solution *Solution B* Half per cent solution of sodium nitrate in distilled water *Test solution* Solution A 50 parts solution B 1 part To 5 c cm of urine add an equal volume of the test solution, shake thoroughly add a strong solution of ammonia in excess allowing it to run gently down the tube so as to overlay the mixture below If the reaction be present a deep red band appears at the junction of the fluids, when shaken it yields a pink or rose coloured foam and after standing several hours a green precipitate forms Use fresh urine and see that the reaction is acid and the urine is filtered Use a freshly prepared test solution

Urinary Sediments

ORGANIZED URINARY SEDIMENT Leucocytes appear in small numbers in normal urine If they are present in abundance the urine is cloudy This finding indicates an inflammatory or purulent process in one portion of the urogenital tract (gonorrhœa cystitis pyelitis nephritis) the more accurate localization of which often demands further investigation With jaundice the leucocytes in the urinary sediment sometimes contain fine crystals of bilirubin

With chronic gonorrhœa the urine contains fine shreds of mucus sometimes mixed with leucocytes and occasionally intracellular gonococci even though the original infection has taken place years before These mucus shreds are discharged from the prostate or posterior urethra Red blood corpuscles are present in the sediment with the most various hæmorrhagic conditions in the urogenitial tract Cells of renal epithelium are small round or cuboid with a vesicular nucleus They are usually poorly developed and often filled with fat droplets Epithelial cells from the bladder ureters or renal pelvis are indistinguishable from each other Those from the superficial layers are flat and polygonal from the deeper layers round or irregular in contour (pear shaped) and contain a vesicular nucleus With an inflammatory process involving the bladder or upper urinary passages large numbers of such epithelial cells accompanied by leucocytes are to be found in the sediment It is therefore impossible by microscopic examination alone to ascertain exactly which portion of the upper urinary tract may be diseased The vagina and prepuce are covered with pavement epithelium similar to that of the mucous membrane The male urethra is lined with cylindrical epithelium Gonorrhœal pus sometimes contains such cells but is distinguished particularly by the presence of gonococci

Casts

CASTS Casts are formed in the renal tubules They occur in large numbers in acute nephritis and in chronic nephritis with œdema and less profusely with the contracted kidney and with those forms of albuminuria associated with circulatory failure or fever With icterus bile stained casts may be observed In severe cases of diabetes mellitus large numbers of coarsely granular casts are sometimes found in the urine

Types of Ca

The following types of casts are distinguished *Hyaline casts* which consist of a homogeneous transparent substance and are often indistinct in outline *Granular casts* with fine granular matrix are otherwise similar to hyaline casts They occur however almost exclusively with true renal disease *i e* with acute or chronic nephritis *Waxy casts* are refractile often yellowish with a distinct contour which is sometimes irregular They are met with chiefly in chronic renal disease and indicate a more severe degree of renal involvement *Epithelial casts* are made up of desquamated epithelial cells from the renal tubules *Red blood cell casts* represent masses of red blood cells closely packed together *Cylindroids* are long irregular masses of mucus and are of no diagnostic significance

Micro-organi

MICRO-ORGANISMS may always be demonstrated in specimens of urine which have stood for any length of time It is therefore advisable to search for bacteria only in a freshly voided specimen or still better in one which has been obtained by means of a sterile catheter With cystitis and pyelitis bacteria usually *B coli communior* are found more rarely staphylococci streptococci and penumococci In foul smelling urine *B proteus vulgaris* is sometimes present a short variable rod which liquefies gelatine In tuberculosis of the urogenital tract tubercle bacilli are to be found in the urinary sediment

93 Varicose Veins

These are dilated, permanently lengthened and tortuous veins affecting mostly the superficial veins of the leg, spermatic veins and the hæmorrhoidal plexus in the rectum constituting piles.

The condition is due to some inherited weakness of the venous wall or irregularity in the arrangement of the valves or in cases of veins of the legs some peculiarity in the lower fascial border of the saphenous opening Besides these, other factors include persistent distension of a vein due to some pressure from above such as, a pregnant or displaced uterus or a pelvic tumour, an abnormal communication between an artery and a vein may also result in a varicose condition of the latter The tendency to varix increases with age and is favoured in old age on account of relaxation of the system resulting from sedentary habits

TREATMENT *Palliative treatment* All sources of obstruction are to be removed Massage is to be resorted to and the application of an elastic stocking or an India rubber bandage is useful in these cases The bowels should be regulated and measures to promote general health should be adopted Varicose ulcers and eczema are to be treated with soothing and drying ointments

Injection treatment The idea of injection treatment of varicose veins is to introduce some sclerosing solution of a drug to cause a chemical injury to the endothelium It sets up a plastic thrombophlebitis without causing much pain to the patient whereby obliteration of the vein is also secured The solution for injection should be cheap, easily dispensable, non toxic, and should not produce any constitutional disturbance Further it should be sterile and antiseptic so that it does not produce any inflammatory changes at the site of injection Prior to injection the site is to be rendered surgically aseptic The following solutions are used (1) 30 per cent lithium salicylate with 1 per cent tutocaine (lithocaine) It is considered to be one of the best solutions and should always be freshly prepared before injection The usual dose is 4 c.cm The clot produced after injection is firm, hard and extensive with a minimum amount of local reaction It produces local necrosis of subcutaneous tissues if the solution leaks outside and around the vein during the injection (2) Quinine urethane solution contains quinine hydrochloride (B P) 60 gr, urethane 2 gr and distilled water 30 c cm (Genevrier's solution) The dose varies from $\frac{1}{2}$ to 2 c cm Test for quinine idiosyncrasy should be made before the injection The injection is painless and the sclerosis produced is extensive and permanent A dose larger than 3 c.cm should never be injected The drawback of the injection is that untoward effects sometimes follow administration of quinine and an indolent ulcer may be produced if the solution leaks into the subcutaneous tissues (3) Salt solution The solution used consists of a 20 per cent solution of sodium chloride to which 1 per cent tutocaine has been added This is suitable for small intradermal varicose veins only Sometimes the solution is too strong for the veins resulting in sloughing ulcers (4) Sodium morrhuate 5 to 10 per cent solutions are used with the addition of 0 5 per cent phenol as preservative If 5 per cent solution is used $\frac{1}{2}$ to 1 c cm of it should be injected at different sites, three to four inches apart, the maximum dose should not exceed 5 c cm at one sitting The tendency to production of an injection ulcer is less but the end results are disappointing as they may show some degree of recanalization (5) The twin injection with quinine urethane (2 c cm) and lithium salicylate 4 c cm injected from two separate syringes simultaneously at a distance of two to four inches in the same vein are best practised on large tortuous veins The results are satisfactory

ations Contraindications to injection treatment are deep thrombosis of veins phlebitis pregnancy, advanced cardiac, pulmonary and renal disease, diabetes, marked

cirrhosis of liver, generalised skin diseases Complications of injection treatment are, injection ulcer, cellulitis, pulmonary embolism and infarction

The results of excision of varicose veins have not been satisfactory in all cases The scope of operation varies with the actual conditions present and the surgeon plans his operations on the merits of individual cases *Excision of varicose vein*

91. Vertigo

The word vertigo means rotation and it is defined as a sensory disturbance with hallucinations of rotation, either of the patient (subjective vertigo) of his surroundings (objective vertigo) or both Russell Brain holds that in vertigo the common factor in these hallucinations is the abnormal feeling of spatial disorientation, no matter what plane they occur in and so he defines it as the sensation of a disordered orientation of the body in space The nuclei and ganglia in the mid and hind brain are closely linked together and they all take part in the tone and position of the body, both static and kinetic They are also in touch with the ear and eye and with the cornua of the spinal cord The cerebellum and the nucleus of Deiters with their afferent vestibular influences are chiefly responsible for the symptom complex of vertigo The cerebellum is essentially a co-ordinating centre for equilibration Besides its afferent impressions from muscles and the muscles of the head and eyes concerned in the maintenance of tone and balance of the body, the most important are those from the semicircular canals of the ear *via* the nucleus of Deiters The semicircular canals form a sensitive register of stability and equilibrium When stimulated, the labyrinths respond by external symptoms of vertigo, nystagmus and forced movements of the head and body *Definition*

AETIOLOGY AND CLINICAL TYPES *Aural vertigo* A systematic examination of the ear by the otologist is most essential Wax in the external meatus, a blocked Eustachian tube, nasopharyngeal catarrh, middle ear disease cholestomata, disease of the mastoid antrum, all should be borne in mind A lack of patency of the Eustachian tubes with invagination of the tympana is a most potent cause of vertigo Spasm of the tensor tympani or stapedius can also cause vertigo by disturbing the stapes *Auditory vertigo* is not commonly produced by labyrinthine diseases but by other inflammatory causes and pressures from without or it may be entirely a reflex phenomenon A patient with auditory vertigo experiences a sense of rotation either of himself or of his surroundings As manifestations of cochlear disturbances, deafness and tinnitus might develop, nystagmus, forced movements, nausea and vomiting may also be seen In Menieres disease, the vertigo is severe and auditory in type In the acutest form of the disease, the symptoms comprise giddiness, reeling, deafness, tinnitus, nausea vomiting, cold clammy sweat, etc Various causes have been brought forward to explain the syndrome but the ætiology is obscure Meniere originally suggested that hæmorrhage into the labyrinth was responsible for the condition while others believe that this is due to a faulty water metabolism The cerebral type of vertigo is less severe than the labyrinthine one *The common causes are cerebellar abscesses,* tumours particularly in the posterior fossa, vascular cerebral lesions, etc *Ocular vertigo* is due to a low degree of astigmatism a strabismus of paralytic type and anomalies of muscle balance—heterophoria A simple test of ocular vertigo is to ask the patient to open and close his eyes If vertigo is present when the eyes are open, the vertigo is ocular and not aural Cardio vascular causes Sudden cerebral hyperæmias or cerebral anæmia, organic heart disease with vasomotor failure, low blood pressure in convalescents, Stokes Adams' Syndrome and other arrhythmias are all predisposing factors of vertigo *Aetiology*

Miscellaneous causes Vertigo is often complained of by neurasthenics and this is a common complaint of the female sex at the menopause In disseminated sclerosis a sensation of dizzy swaying is complained of The vertigo which sometimes becomes severe and paroxysmal in nature is of pontine origin Irritation due to intestinal parasites may be a reflex cause of vertigo Of other reflex causes, diseases of the pelvic viscera in females deserve mention The toxic causes resp
as c
both
and
vertigo Epilepsy and migrane have also aura of vertigo A small dose of quinine can differentiate an auditory vertigo from epileptic aura It relieves the vertigo but not epilepsy Finally, endocrine and vegetative disorders with unbalanced *sympathetic and parasympathetic systems,* should always be considered as potent causal factors of vertigo

1 *Postural deviation* The patient, with eyes closed and feet brought together, tends to fall towards the diseased side in irritative vestibular lesions 2 *Kinetic deviation* (Barany's pointing test) The patient sits opposite to the physician and raises his arm, with the elbow straight to touch the tip of the physicians finger with his own He is then asked to repeat this with eyes closed If the labyrinth on one side is paralysed he tends to deviate or point past to the side of the lesion 3 *Nystagmus* Irritative labyrinthine lesions produce spontaneous vestibular nystagmus to the opposite side, that is, the eyes make a slow movement to the same side and a rapid twitch back to the opposite side 4 *Rotation test* The patient is seated in a chair which is very rapidly rotated for some time The chair is then stopped and the patient looks in a direction opposite to that in which he has been rotated Normally there is nystagmus in a direction opposite to that in which he has been rotated 5 *Caloric test* In *this test, the tympanum should at first* be *inspected to see that it is not perforated* and the external auditory meatus is free from wax and growths The patient lies down and the external meatus is syringed with cold water (68°F) Cold air blown through a coiled tube cooled by a spray of ethyl chloride may also be used as a stimulus Hot water (120°F) is used when no response is obtained with cold stimulus If the labyrinth is intact the normal response to the stimulus is in form of a nystagmus away from the tested side A hot stimulus generally results in nystagmus towards the tested side If the nystagmus is not produced there is a paralytic labyrinthine lesion

TREATMENT If the treatment is to be successful a correct diagnosis of the underlying cause is most essential *The treatment of vertigo is therefore one of* its primary cause Luminal in doses of ½ to 1 gr thrice daily, is of particular benefit in auditory peripheral vertigo In severe cases, alcoholic injections have been tried Marked success has sometimes been achieved by the section of the auditory nerve In case of blockage of the Eustachian tubes, inflation by an Eustachian catheter should be resorted to Tweedie reports encouraging results by using small doses of iodides (1 or 2 gr) thrice daily when inflation or dilatation methods failed to cure or improve the condition Very small doses of sulphate ... the sensibility of
ose of 1/96 gr
Amyl nitrite
restriction of
fluid intake (40 oz in 24 hours) and iodides should be the ... sheet anchor in the disease In neurotic cases, bromides such as bromide of sodium (20 gr at

night) afford prompt relief The belladona group of drugs is very helpful in sea sickness Chronic infections of the nasopharynx tonsil teeth accessory air sinuses should be dealt with on usual lines Various operations are performed [illegible] of the outer and middle ear Per carotid sympathectomy may [illegible]

[illegible] bottles applied over the occipital region

95 Visceroptosis

Definition

Visceroptosis or Glenard s disease, denotes a syndrome characterised by an abnormal descent of the abdominal viscera with signs of irregular abdominal pains and dyspepsia The descent of viscera is usually due to a fall in intra abdominal pressure and is often associated with impaired tone of the abdominal and pelvic muscles When the intra abdominal pressure is abnormally low the organs drop directly due to gravity and the degree of ptosis of different viscera depends upon their weight and also upon the length and elasticity of their peritoneal attachments which act as true ligaments for the support of the organs A considerable amount of stretching and even damage is done to the abdominal and pelvic muscles during pregnancy and parturition in women and if sufficient rest is not enjoined later on the tone of such muscles is permanently impaired Weakness of abdominal muscles is also commonly seen in individuals who are not used to moderate amounts of exercise daily for the upkeep of health In cases of malnutrition in conditions like rickets and prolonged pyrexia degeneration and even atrophy of muscles have been marked

Causes

Sometimes the greater curvature of the stomach has been found after radio graphy to descend as low down as the true pelvis and the condition is then called *gastroptosis* The condition has however been found to be congenital. Glenard has observed in *enteroptosis* kinks of the intestine especially at the flexures of the colon pelvic cæcum and a low transeverse colon are often referred to as if they are invariably associated with constipation In *hepatoptosis* the liver drops rotates towards the right or sometimes falls forward so that its upper surface bulges in the epigastrium In these cases the liver is not enlarged but is simply displaced In case of a dropped spleen the organ can be shifted to its original position and such is also the case with the kidneys

Various other causes have also been suggested for the displacement of abdominal viscera and the principal ones include a congenital malposition a pendulous abdomen with excess of intra abdominal fat and faulty postural habits In all these cases the symptoms if any usually abate when the patient lies down and the organs resume their original positions

Symptoms

The symptom is a vague pain experienced by the individual only when an erect position is assumed and is temporarily relieved when the lower part of the abdomen is compressed by some suitable means Besides signs of dyspepsia are often complained of by the sufferers The symptoms are usually long standing and ultimately the victims become neurasthenic

Treatment

TREATMENT The condition in most cases can be prevented by suitable teratment Prolonged rest combined with suitable diet and tonics go a long way to prevent the condition in parturient women Constipation if any should always be corrected by proper purgatives Graduated exercises should be taken by women to strengthen their abdominal and pelvic muscles particularly after child birth This helps to regain their normal postural tone and thus raise the intra abdominal pressure When the organs have dropped down low in the abdomen some sort

of support is required to hold them A suitably fitted Curtis belt, serves the purpose well Much comfort is then experienced by patients and most of the symptoms disappear When the visceroptosis is due to weakness of the pelvic floor, exercise, local treatment by pessaries or even operation may be required to restore the tone of the muscles In all these cases prolonged rest in bed constitues the proper line of treatment The normal routine should be gradually taken up by the patient only when symptoms subside The diet should be of a mixed type including sufficient amount of proteins, fresh fruits fats but not carbohydrate for symptoms of flatulent dyspepsia predominate in these cases The meals should always be small but taken at frequent intervals so as to avoid over loading of the stomach The intake of fluids should be similarly restricted Of the drugs, sedatives may be conveniently administered to neurasthenic subjects to calm their irritated nervous system and to promote sleep If anæmia is present its treatment

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cal operations to

restore the organs to their respective positions should be adopted as a last resort

96 Vitamins. See page 102

97. Vomiting and Nausea

Vomiting or regurgitation of the stomach contents through the mouth is one of the emergencies sometimes required to be urgently attended to The two symptoms of nausea and vomiting are common in many diseases where the latter is preceded by the former Various causes may be grouped according to peripheral or central origin Psychic impressions from unpleasant sights odours or even thoughts any profound emotion such as grief, anger or fear count in a number of cases Functional nervous disorders such as hysteria neurasthenia and psychasthenia are also held to be common factors in the causation of the symptom Habit plays an important role in many cases Diseases of the brain and its meninges brain tumours or cases of head injury are responsible in cases where it is of central origin It also occurs in such diseases as dengue malaria cholera scarlet fever, nephritis migraine and is a common symptom in sea sickness mountain sickness and car sickness It is commonly met with in a variety of pathological processes in the abdomen such as appendicitis intestinal obstruction and diseases of the biliary apparatus and the urogenital organs Irritation of the eyes ears nose larynx pharynx œsophagus stomach or the upper intestinal tract is also a common ætiological factor It is met with in pelvic diseases disorders of menstruation and pregnancy in women It is also seen after the

The prolonged intake

sometimes responsible

ndition and the caus s

spasm pyloric stenosis

over feeding habit vomiting and worms The actual act of vomiting is preceded by giddiness salivation rapid pulse and breathing

TREATMENT The treatment of all cases should aim at the investigation of the causal factors Perfect mental and physical rest should be enjoined and the patient should be put to bed in a darkened room and excluded from noise excitement, business cares and domestic worries When sleep is induced nausea

subsides in most cases An ice bag to the head or sucking lumps of ice is often of distinct advantage Many advocate the application of cold to the head and heat to the abdomen Mustard poultices to the epigastrium have constituted a favourite domestic remedy from time immemorial During nausea there is usually more or less complete anorexia and as feeds by mouth are likely to aggravate the condition parenteral routes are usually resorted to for the nourishment of the patient The administration of saline and glucose combined with insulin is of particular benefit in these cases A 5 per cent glucose solution is an ideal feed during this time Half to one fluid ounce of carbonated water or ginger ale every ½ to 1 hour are useful drinks and are known to relieve the condition As the condition improves a change of dietary may be instituted with the inclusion of strained soups well cooked cereals and cereal broths or a suitable diet may be chosen according to the liking of the patient In cases of protracted gastric vomiting washing out the stomach with ½ per cent sodium bicarbonate solution is sometimes very effective and this should always be tried when a toxin is suspected to be the cause of the condition Tincture of iodine in 1 min doses in a teaspoonful of water given every half an hour is sometimes useful In cases of constipation and indigestion the bowels should be evacuated with suitable

mostly used The drugs are helpful in cases of irritation of the pharynx œsophagus or stomach Of the bismuth salts bismuth subnitrate is usually given on an empty stomach in 30 gr doses repeated every 2 hours till the condition improves In nausea or vomiting of pregnancy hysteria epilepsy and migraine oxalate of cerium is used in doses of 3 gr The local application of cocaine to the nasal mucous membrane has been recommended for the relief of nausea The treatment of cardiospasm in infants consists in giving non irritating diet and the occasional introduction of bougies through the cardiac orifice In pyloric stenosis daily gastric lavage is of benefit and surgical treatment affords a radical cure Over feeding in children should never be encouraged and feeds should be served at regular interval

98 Warts (Verruca)

The treatment of warts is very important as every practitioner is expected to deal with such cases in daily life Warts may occur in every part of the body The cause is obscure though it has been suggested that a filterable virus is responsible These growths are usually sharply demarcated from the surrounding skin The chief symptom is pain on pressure Warts should be distinguished from corns or callosities *Causes*

TREATMENT Should aim at complete removal of the growth if any portion is left regrowth will occur Drugs are of little value for the purpose Caustics such as trichloracetic acid nitric acid or pure carbolic acid have been used but are not suitable Excision is likewise not desirable for uncontrollable bleeding

may occur The following are some of the agents that are commonly employed (1) *Radium* application is the best method but it is not within the reach of every case After such treatment the wart becomes soft and macerated and then separates leaving a cavity which requires filling with antiseptics for some time (2) *X rays* A full pastille dose should be administered using a 1 mm aluminium filter The surrounding skin must be protected Pain disappears always after treatment (3) *Carbon dioxide snow* Warts may be frozen with snow The stick is held against the growth for ½ to 2 minutes Preceding such treatment the wart may be softened by prolonged hot fomentation or by the application of a 25 per cent salicylic acid plaster about 24 hours before If treatment is successful the wart is found adherent to the blister formed by the snow This should be cut away and the cavity is filled with bismuth subgallate powder or packed with cyanide gauze (4) *Electrolysis* It is difficult to ascertain the exact time of destruction of the growth with electrolysis and it is not recommended (5) *Curettage* A general anæsthetic if warts be multiple or a local anæsthetic like novocaine may be used if a few only are present during curettage All traces of warty materials should be scraped away with a sharp curette (Volkmann s spoon) Bleeding is controlled with the galvano cautery The part is then painted with iodine and a dressing applied If the patient complains of much pain a 5 per cent stovaine ointment may be applied (6) *Vaccines* made from the emulsion of tissues may be tried along with local treatment Intramuscular injections of bismuth salicylate (2 gr in 1 c cm of sterile olive oil) have been favourably reported only two doses are required

99 Whooping Cough (Pertussis)

It is an acute specific infectious malady characterized by catarrh of the respiratory … llowed by a long noisy inspira tion (whoo… The disease is especially one of childhoo… The period of incubation is from 3 to 1… igou the causal organism is a cocco bacill… sent in the mucous membrane of the respiratory tract

Diagnosis (1) Clinically the onset is marked by a preliminary catarrh which lasts for 7 to 14 days Towards the end of the period the cough assumes a paroxysmal character with occasional attacks of vomiting Several paroxysms may occur in quick succession Each paroxysm consists of a rapid succession … re continued until … e laryngeal spasm … of coughing large … The presence of … onsiderable in the … y evidence (4) … Gengou medium

TREATMENT (1) *Isolation* should be enforced but free ventilation and fresh air are necessary The diet should be light and when vomiting is present food should be given in small quantities at intervals (2) *Drugs* During the catarrhal stages a simple expectorant mixture is useful to control paroxysms Belladonna in fairly large doses (10 to 20 min of the tincture) is the most effective drug other sedative drugs are bromide antipyrine chloral hydrate Benzyl benzoate has been recommended in doses of 5 to 40 min of a 20 per cent alcoholic solution 3 to 4 times a day intramuscular injections of 1 to 2 c cm of

ether are said to reduce the number of paroxysms but the method is painful (3) *Vaccines* prepared from Bordet Gengou bacilli is or associated with other organisms have been used both as prophylactic and curative but the effect is uncertain (4) *Radiotherapy* is said to mitigate the severity of infection

Prophylaxis

Prophylaxis (1) The patient should be isolated for about 5 weeks from the commencement of the whoop provided the paroxysmal cough has ceased for a fortnight (2) Disinfection of room and clothing (3) Convalescent serum and vaccine may be used prophylactically

100 Yaws (Framboesia)

Definition

Yaws is a specific infective granuloma caused by a spirochæte *Treponema pertenue* It is not a venereal or congenital disease though the course resembles syphilis The causal organisms *T pertenue* gain access to the body through insect bites cuts abrasions etc Varieties of yaws are (1) Crab yaws affects the sole of the foot (2) Gangosa granuloma ulcerating in the palate (3) Goundou a nodular swelling on the nose (4) Juxta articular nodules may form tumours near the knees or elbows

Diagnosis

Diagnosis The primary lesion occurs extragenitally which is not always demonstrable The secondary stage consists of development of papules which may coalesce into larger masses Later the scales fall off the characteristic ramboesia is derived yellow crust resembl in abundance in the practically all cases It is distinguished from syphilis by the facts that the primary lesion is never venereal ...

Treatment

TREATMENT For an adult 0 5 to 0 6 gm of salvarsan intravenously or sulpharsenol intramuscularly The lesions heal after 2 to 3 injections but it is advisable to give 6 injections at weekly intervals Locally the sores should be dressed with mild antiseptics

Prophylaxis Isolate the patient and protect the open ulcers

101 Yellow Fever See page 900



SUPPLEMENT

1. The Typhus Group of Fevers—Rickettsial Diseases

(Continued from page 874)

Rickettsial pox—This most recent addition to the rickettsial fevers first identified in 1946 in New York City, and later in Boston, has certain clinical resemblances to scrub typhus and to chicken pox The abrupt onset fever and headache are typically those of the typhus group, though mild and brief, but the maculo papular lesions of the rash develop vesicles that dry to form a black crust which falls off within seven days, leaving no scar The Weil Felix reaction is negative Strains may be isolated and maintained in the guinea pig and mouse The causal organism is the *Rickettsia akari*, resembling *R prowazeki* Strains have been recovered from house mice (Mus musculus) and from rodent mites (Allodermanyssus sanguineus) Early results of immunological tests suggest that the disease is related to the spotted fever group

Treatment of Rickettsial Diseases—"During the past five years the problem of the treatment of all rickettsial diseases has been essentially solved by the discovery of three wide range antibiotics chloramphenicol, aureomycin and terramycin all of low toxicity in the recognized therapeutic doses and readily absorbed from the gastro intestinal tract In those rickettsial diseases most thoroughly investigated amongst them those of the gravest prognosis namely typhus exanthematicus, scrub typhus and Rocky Mountain spotted fever, these antibiotics have proved to be a veritable therapeutic scythe The clinical manifestations are abolished within two or three days Relapses are very uncommon, and invariably respond to re treatment, the development of any degree of drug resistance that might interfere with this has not occurred The antibiotics are effective even when given quite late in the course of the disease although defervescence may then take a day longer and require longer therapy Their efficacy will be exemplified by the use of chloramphenicol in scrub typhus since this has been extensive and the results differ little from those obtained in other members of the rickettsial group In Q fever and rickettsial pox some reservation about their specificity must be made in the former because of its variable severity, in the latter for lack of sufficient data"

'In 1947 Smadel and his associates at the United States Army Medical Research and Graduate School, working with eggs and mice, showed that chloramphenicol acted powerfully on experimental scrub typhus Trial in the human disease was clearly warranted, and collaborative studies were speedily instituted in Malaya where the occupational nature of the disease ensured a succession of patients among estate labour and military personnel Of some 150 cases treated all responded promptly'

'The drug is given orally in gelatin capsules usually as an initial dose of 3 to 4 g calculated on a basis of 60 mg per kg of body weight followed by 0 25 g at three hourly intervals for 24 hours For ill nourished patients some prefer a smaller initial dose, or to split it into three and to give 1 g hourly Giles and Symington used with sucess only a single dose of 3 g For about 12 hours the clinical condition remains unchanged Thereafter toxicity declines

harply and within 48 hours the patient is afebrile, placid, and claimant for food This success prompted Smadel and his colleagues to make prophylactic trials n volunteers exposed to infection in hyperendemic areas They showed that, n one such trial a weekly dose of 4 g of chloramphenicol given for six weeks was so effective that only 1 of 31 volunteers developed typical scrub typhus, in contrast with an incidence of 13 cases amongst the 18 volunteers of the control group These trials continue"

"Aureomycin gives similar results in the therapy of scrub typhus, including relapses in cases treated very early and the prompt response to further treatment Terramycin lacks extensive trial but Smadel and his colleagues found it effective in eight patients though less prompt (by 12—24 hours) in securing defervescence For the treatment of scrub typhus their order of preference is chloramphenicol,

Aureomycin in scrub typhus

experimental pathologist are no longer necessary for the administration of any of the three antibiotics in the recognized therapeutic doses" (Brit Med Jour, 1952 Oct 18, p 876)

2 Chemotherapy of Tuberculosis

(Continued from Page 811)

The Medical Research Council (1949) arranged to carry out carefully controlled trials of streptomycin The results of these trials showed that

Streptomycin & P A S

and recent haematogenous lesions in almost any part of the body In fact the better the blood supply to the lesion, the more successful was the treatment. Conversely, a preponderance of fibrous tissue and of limitation of the disease to the lymphatics lessened the effect of the drugs It was found that lesions in which there was fibrosis caseation, and devascularization of the tissues did not respond very well to streptomycin and PAS treatment The treatment is at present proving useful in the progressive primary lesion and in the control of a recent extension of an old l

stream

Toxic symptoms following the use of streptomycin are not common With the usual dosage of 1 g daily, and from 15 to 20 g of P A S, it is only occasionally that deafness vertigo dermatitis or ataxia arise This treatment is also combined with pneumothorax in some cases with pneumo peritoneum Certain individuals show a hypersensitivity to the antibiotic, and others cannot take the P A S, which may cause vomiting, anorexia, and in rare cases the symptoms of hypocalcaemia In cases of meningitis complications arise more frequently, and permanent deafness and disturbances of mental function are not uncommon sequelae

Toxicity

Perhaps the most serious drawback to the use of streptomycin is the power of the tubercle bacillus to develop resistance to the drug. This can be overcome to some extent by combining the streptomycin with PAS. Thiosemicarbazone (thiacetazone) will also suppress the development of streptomycin resistance but sooner or later the complication develops (Practitioner, 1952, 169, p 412—413).

STREPTOMYCIN AND DIHYDRO STREPTOMYCIN

Tuberculosis.—Dihydrostreptomycin is produced by catalytic hydrogenation of streptomycin. Its bacterial spectrum is the same as streptomycin but it is more stable. It is not inactivated by cysteine and semicarbazide. It produces resistance in tubercle bacillus in the same way as streptomycin. Consideration of the toxic effects of streptomycin and dihydrostreptomycin on the 8th cranial nerve is important. If one were more effective than the other there would be no problem but there appears to be little if any difference between them in this respect. The choice therefore must depend entirely on their toxicity. It is now considered that a dose of 1 g. of streptomycin daily is adequate in most varieties of tuberculous disease, and there is some evidence that in certain types of pulmonary tuberculosis this dose need be given only every third day. With these doses the differences between the incidence and severity of the vestibular damage caused by streptomycin and dihydrostreptomycin are very small and of no practical significance. But the drugs differ much more in their effects on the cochlea. There have been many reports of an increased incidence of deafness with dihydrostreptomycin used for tuberculosis meningitis. Except in the very rare instances of severe sensitivity reactions to streptomycin in which desensitization has failed there seems to be no reason why dihydro-streptomycin should be used at all in the treatment of tuberculosis.

TREATMENT OF TUBERCULOSIS WITH ISONIAZID

Summary of Interim Report of Tuberculosis Chemotherapy trial Committee.—

In a clinical trial of Isoniazid (isonicotinic acid hydrazide) 331 patients with various forms of pulmonary tuberculosis were studied by Tuberculosis Chemotherapeutic Trial Committee. 173 were treated with Isoniazid (200 mg daily), 158 with streptomycin (1 g. daily plus PAS 20 g. daily). Treatment was randomly allocated in all cases. Three main groups were observed. Group 1 with acute rapidly progressive disease of recent origin. Group 2 with other forms suitable for chemotherapy. Group 3 with chronic disease considered unlikely to respond to chemotherapy.

acid

On admission the two treatment series had a similar distribution of patients with severe and less severe illness. Isoniazid showed low toxicity at the dosage used and for the period of three months. At the end of three months there was rather more improvement in general condition in the patients on isoniazid than in the other patients but the differences were not great.

The conclusion, judging wholly from short term results, is that Isoniazid is a very effective drug in pulmonary tuberculosis but given alone it is not more effective than streptomycin plus P. A. S.

Bacillary resistance to Isoniazid was found in 11% of cases at the end of the first month, in 52% at the end of the second and in 71% at the end of the third. Lack of progress as assessed by radiological change was found to be related to the emergence of drug resistance. This is therefore a most serious

Drug

problem affecting the use of Isoniazid The effects of combining Isoniazid with other drugs are under study

Surgical Measures Removal of ribs to produce callapse and resections of lung are now practiced in treatment

3. Treatment of Leprosy

(*Continued from page 832*)

The detailed diagnosis of leprosy and the classification of the type are important in determining the best line of treatment The skin is now recognised to be the site of entry of the leprosy organism The leprologist is therefore depending more and more on the lepromin test and the study of the histopathology of the lesions of the skin In doubtful cases it is wise to send a biopsy specimen from the suspected lesion including if possible a small subcutaneous nerve supplying the area, for detailed examination Sections should preferably be fixed in Zenker s solution, washed for 12 18 hours and despatched in 40% spirit, formol saline may be used for fixation but is less satisfactory The effect of B C G vaccination on the lepromin test is being studied but there is evidence that a negative lepromin reaction can be converted into a positive by vaccination

Sulphone

Sulphone therapy has become the standard treatment of the disease, 25 mg of diamino diphenyl sulphone (D D S or 'dapsone") can be given as a commencing dose twice a week This should then be increased by 25 mg every 14 days until 100 mg twice a week is reached The dose is then further increased by 100 mg each month to a maximum of 400 mg twice a week Alternatively sulphetrone in aqueous solution (50%) can be given by deep subcutaneous or intramuscular injection, 0 5 ml twice a week This dose should be increased by 0 5 ml each month until 3 ml is given twice a week Thiosemicarbazone is generally believed to be less effective than the sulphones, but it is a useful stand by for patients who show intolerance to the sulphone group of drugs The commencing dose is 25 mg daily, increasing by 25 mg every week until 150 mg per day is given Lepra reactions necessitating cessation of sulphone treatment may occur Specific therapy at half the dose which produced the reaction should not be recommenced until all signs of reaction have subsided Children of 12 and under should receive half the adult dose of the drugs Shlphone therapy should be continued for at least one year, preferably two years is advised after standard methods of examination have yielded negative results or, if the case is nonlepromatous for 18 months after all activity of the lesions has ceased

In most institutions sulphone therapy has very largely replaced hydnocarpus treatment The general tendency because of its ease of administration and cheapness, is to use oral diaminodiphenyl sulphone ('dapsone') in twice weekly dosages

Cortisone

Recently cortisone has been advised for lepromatous reaction, particularly in that type known as erythema nodosum leprosum But it has been found that, while cortisone temporarily stops the reaction, it later results in the spread of the disease For severe nerve pains 4 ml of a 2% solution of procain injected into the nerve sheath will be found useful If the nerve is swollen and tender, particularly in tuberculoid cases, the nerve sheath should be excised surgically The necessity for physiotherapy and orthopaedic measures, including operative procedures for the relief and prevention of deformity, must be borne in mind, so that the patient, on recovery from leprosy, may not become seriously handicapped through permanent contractures (Brit Med Jour, 1952, Aug 9, p 330)

4. The Enteric Fevers

(*Continued from Page 758*)

Chemotherapy with chloramphenicol has completely changed the prognosis from what it used to be. In typhoid fever an initial dose of 3 g, followed by 1.5 g 12 hourly for four to five days, thereafter treatment is continued for a further 10 days, with a daily dose of 1.5 g. With such a regime an obvious icol diminution of toxaemia and subsidence of fever may be expected in an average of four days. Many clinicians prefer to begin treatment more gently with divided dosage. Three important considerations must be borne in mind. First relapse is not infrequent. It is for this reason that treatment should be continued for eight to ten days after the initial subsidence of fever. The injection of typhoid vaccine has been suggested in order to encourage the formation of specific antibodies but it remains to be seen whether it is therapeutically successful. Secondly it must be realized that obvious clinical improvement will usually precede the healing of the ulcers; in other words perforation or haemorrhage may still occur even when the temperature has returned to normal and the patient is apparently progressing satisfactorily. Lastly clinical cure must not be taken to imply bacteriological cure. Patients may continue to excrete the organism in the faeces long afer an apparently rapid response to the initial treatment.

5 Antibiotics

(*Continued from Page 688*)

It is striking how penicillin had converted many serious diseases into trivial complaints. Only a few of the antibiotics discovered had come into use since s of many were toxic and others ineffective. In clinical use it is necessary to select an antibiotic which is effective against the particular infecting microbe and also to ensure that it reached the microbe (and not only the blood stream) in therapeutic concentration. Combinations of antitibiotics should be chosen with care. Antibiotics have been devided into two groups: group 1 including penicillin streptomycin and bacitracin and group II chloramphenicol aureomycin and terramycin. It is safe and often helpful to combine drugs in group I but there is no advantage in mixing drugs in group II. The greatest care is needed in combining a drug from group I with one from group II since if the organism is sensitive to the group I drug there would be antagonism although if it was insensitive there would be synergism.

A number of biological factors are probably concerned with the action of antibiotics in the body. The direct toxic effects of antibiotics vary enormously; actors penicillin is quite safe whereas streptomycin and to a less extent aureomycin and s chloramphenicol could be dangerous. Complications could also arise from allergy and from rapid destruction of bacteria. The extent to which antibiotics interfere with the development of natural immunity is uncertain. Secondary effects of antibiotics therapy arise from the development of resistant organisms and from suppression of normal intestinal bacteria which were useful to the body.

Behaviour in the Body.—After absorption streptomycin aureomycin and terramycin are rapidly distributed throughout the extracellular fluid but penicillin and and chlormphenicol are more widely distributed and are poorly concentrated in certain tissues. Behaviour of antibiotics at the blood brain barrier varies; penicillin and terramycin concentrated poorly in the cerebrospinal fluid but chloramphenicol diffuses rapidly. All antibiotics are excreted by the kidneys but

whereas penicillin and terramycin are predominatnly disposed of in this way chloramphenicol and aureomycin are to a large extent broken down by the body Absorption of penicillin from the intestine is very irregular and there is practically no absorption from the skin

The indiscriminate use of antibiotics is to be deprecated because of the harm ful results which might accrue The increasing number of strains of resistant organisms and the occurrence of crossed resistance between arueomycin and terramycin or chloramphenicol should be borne in mind Antibiotics might have useful therapeutic effects apart from their use in infections Aureomycin prevents the development of some experimental anaemias and has some effect on hepatic cells since it had benefited patients with hepatitis and cirrhosis Aureomycin is also of value in post irrad ation sickness

Crossed resistance

6 Terramycin

The isolation of Terramycin from a new actinomycete *Streptomyces rimosus* was reported in 1950 by Finlay and his co workers from the Research Laboratories of Charles Pfizer and Company of New York Terramycin is an amphoteric compound which forms both the hydrochloride and sodium salts which are very stable The hydrochloride is very stable and even aqueous solut ons retain their potency for prolonged periods It is one of the broad spectrum antibiotics and is active against a wide variety of micro organisms including both gram negative and gram positive types It is also active against Rickettsiae and certain of the viruses both in vitro and in vivo Like aureomycin terramycin also increases the growth rate of chickens poultry and swine when added to their diet in small amounts

Isolation

The drug is absorbed from the gastro intestinal tract and oral administration of the hydrochloride in capsule form maintains effective concentrations in the blood Possessing a low order of toxicity it may be taken in large doses without fear of toxic effects Relatively large doses may cause nausea and vomiting but this is generally not sufficiently severe to necessitate interuption of therapy Soft stools or even mild diarrhoea may result from administration of terramycin due to its profound effect on the intestinal flora and the resultant elimination of many of the normal bacterial flora of the gut This however is rarely serious enough to interfere with therapy and ceases promptly on withdrawal of the drug

Absorption

Antibacterial activity —Terramycin is active in concentrations of 1 to 3 micro grams per c cm against strains of *Aerobacter aerogenes Klebsiella pneumoniae Salmonella typhosa S paratyphi S Schottmulleri S pullorum Shigella paradysenteriae B subtilis Staph aureus Staph albus and Brucella bronchiseptica Escherichia coli* are sensitive to 5 micrograms per c cm Rickettsiae are inhibited by concentration varying from 5 to 20 micrograms per c cm

effects

Terramycin is readily absorbed from the gastro intestinal tract and readily excreted in the urine and fæces After a single oral dose of 2 g the blood

concentration rises rapidly to about 5 micrograms per ccm is maintained at abou this level for 6 to 8 hours and thereafter falls rapidly It is fairly stable in th presence of various body fluids Unlike aureomycin it does not however readil traverse the blood brain barrier Adequate blood concentrations are maintaine by oral administration every 6 hours

Dosage —Crystalline terramycin hydrochloride is available in capsule contain ing 50 100 and 250 mg of the drug calculated as the free base It is al available in the form of an elixir or syrup for administration to children Or dosage varies from 1 to 5 g daily given in 3 to 4 divided doses A study of large series of infections indicates that doses of 1 to 2 g a day are adequate i most infections by organisms susceptible to the drug In severe infections dose of 4 to 5 g daily may be given with safety

Crystalline terramycin hydrochloride in combination with sodium glycinate also available for intravenous use, and is used only for patient too ill to take th drug by mouth It is available in strengths of 250 and 500 mg

Clinical use —Pneumococcal pneumonia responds satisfactorily to terramyci therapy, the temperature generally returning to normal within 48 hours A dose o 2 g daily in divided amounts at 6 hour intervals is satisfactory in most cases I a satisfactory response is not obtained within 48 hours the dosage may b increased to 3-4 g daily

Terramycin has been used in cases of subacute bacterial endocarditis wit encouraging results Satisfactory results have also been reported in both strepto coccal and staphylococcal otitis

In gonorrhœa the use of terramycin has given very satisfactory results an the percentage cure rates in clinical trials in the acute disease in males hav ranged from 91 7 to 98 per cent One gram administered in two 0 5 g dose at 6 hours intervals is said to be sufficient to cure 98 per cent of patients with acute infections In refractory cases the dose may be increased and continue for 2 to 3 days

Terramycin is being increasingly used in surgical infections and is an adjunc to surgical treatment For pre operative intestinal preparation an oral dosag of 3 g daily results in the virtual elimination of the normal aerobic flora withi 48 hours The drug has also been found to be of great value as an adjunct to the surgical treatment of septic or suppurative peritonitis *Soft tissue* lesion respond to oral terramycin therapy in comparitively low dosage and the necessity for operation is avoided in many cases

Terramycin is a valuable addition to the number of drugs of value in th treatment of *infections of the urinary tract particularly in infections* due to *A aerogenes E coli P vulgaris* and *Ps aeruginosa* suggested dosage is 0 5g every 6 hours In intestinal tract infections particularly with *Shigella dysenteriae* and *Sh paradysteriae* terramycin was found particularly useful the diarrhoea

employed is similar to that for aureo ... value in the systemic forms of the disease

Virus Diseases —Terramycin is said to be of distinct value in the treatment

venereum
In primary
symptoms
econd day
t 48 hours

Virus disea

Rickettsial Diseases —In epidemic and endemic typhus terramycin has been used with great success Clinical improvement is manifest generally within the first 24 hours and most patients become afebrile witl in 2 to 4 days The dosage suggested by experience so far is an initial dose of 3 g followed by 1 g every 8 hours The drug should be continued at a reduced dosage for 48 hours after the patient is afebrile In very severely ill patients treatment may be started with 0 5 g intravenously at 12 hours intervals

Rocky mountain spotted fever —In rocky mountain spotted fever satisfactory response is generally obtained with doses of 2 to 3 gm daily by mouth Severely ill patients may be given the drug by the intravenous route in doses of 500 mg at 12 hour intervals

Scrub typhus —Good results have been reported with the use of terramycin in scrub typhus In a number of cases a single oral dose of 3 g caused the temperature to fall within a few hours and the patient remained afebrile Generally a single dose of 3 g or a total dose of 5 g given in divided doses over a period of 24 hours is satisfactory Similar good results have been reported in the case of Q fever and terramycin appears to be even more effective than aureomycin or chloramphenicol 2 to 3 g daily by mouth are adequate for the majority of cases and treatment should be continued for 4 to 5 days after defervescence

7 Bacitracin

In 1945 while studying the bacterial flora of civilian wounds it was noted that at times organisms could be isolated by plating debrided tissue on blood agar plates and that these could not be found when the same material was inoculated into broth cultures The broth cultures however contained large number of a gram positive sporulating organism belonging to the *Bacillus subtilis* group This organism which produces the antibiotic bacitracin has recently been identified as *B lichniformis* It is closely related to *B subtilis* and differs only in a few minor characteristics

Isolation

Bacitracin is readily produced by the Tracey I strain of *B subtilis* in surface culture in shallow layers Later deep tank fermentation methods were introduced and all commercial production is achieved in this way The unit of bacitracin is that amount which when diluted 1 1024 in a series of two fold dilutions in 2 ccm of beef infusion broth completely inhibits the growth of a stock strain of group A haemolytic streptococcus when the inoculum used to seed the tubes is 0 1 ccm of 10^{-3} dilution of an overnight culture in blood broth Theoretically pure bacitracin may possess a potency of approximately 60 units per mg but it appears that the material becomes progressively more unstable beyond a potency of 45 units per mg

Bacitracin is a polypeptide (like Polymyxin and Subtilin) and is like them toxic to the kidneys This toxicity for the kidneys is an inherent property of the drug itself and not due to any impurity Parenteral therapy with bacitracin therefore requires that the patients urine be checked daily for evidence of albumin

and that the blood be examined at least twice weekly for evidence of nitrogen retention For these reasons it is advised that it should be used only in those cases which cannot be treated successfully with other chemotheraputic agents Despite the dis advantages enumerated above, it does possess certain advantage over other antibiotics For one, it rarely sensitizes patients, and is in this respect superior to penicillin for local use Secondly it possesses a marked synergistic action when used with other antibiotics particularly penicillin The use of its synergism is of particular value in the treatment of sub-acute bacterial endocarditis when the infecting organisms are penicillin resistant strains of staphylococci or streptococci

Antibacterial activity —Bacitracin has marked antibacterial action against the gram positive group of bacteria *Staphylococcus aureus, Pnemococcus* I, II and III *Beta haemolytic streptococci*, and certain strains of clostridia particularly *Welchii, Septicum, Sordelli, hystolyticum* and *sporogenes* are all inhibited by high dilutions of the drug In experimental rabbit syphilis it has pronounced synergistic effect with penicillin The same effect occurs with several strains of streptococci Dramatic success has been achieved in subacute bacterial endocarditis by the combined use of bacitracin and penicillin

Bacitracin is white to brownish neutral water soluble polypeptide which is almost as stable as penicillin at temperature below 56°C Its mode of action is not accurately known at present, but it is believed to act on sensitive organisms by interfering with certain enzyme systems that are essential to their development and growth In man the drug produces local pain and injury on intramuscular injection After intramuscular injection it is rapidly absorbed but oral adminisration does not ordinarily result in measurable blood concentrations the greater portion of the dose thus administered being recovered from the faces Because of the nephrotoxicity of the drug its parenteral use is at present limited to hospitals and clinics only

Clinical use —In combination with penicillin in the proportion of 10 parts penicillin plus 1 part bacitracin by far the best results so far have been obtained in the treatment of subacute bacterial endocarditis Doses of 1,000 000 units of penicillin plus 100 000 units of bacitracin daily have given very gratifying results

In combination with streptomycin and polymyxin this drug is used in the [illegible] which the infecting agent is largely confined [illegible] ive colitis Tablets containing 250 mg [illegible] in and 5 000 units of bacitracin may be employed in doses of 1 tablet every 4 hours daily for 1 to 3 weeks

Success has been reported with the intrathecal use of bacitracin in the treatment of staphylococal meningitis which had proved to be refractory to treatment with penicillin 5 000 to 10 000 units daily were used by the intrathecal and intra ventricular route Bacitracin has also been employed in the treatment of other staphyloccocal infections such as osteomyelitis, staphylococcal bacteraemia staph pneumonia and various surgical infections

8. The Search for Viricides

(Continued from Page 928)

Virus Diseases —Some of the larger viruses such as the psittacosis lymphogranuloma group are susceptible to chloramphenicol and other antibiotics but there is no solid evidence that any drug is effective against the smaller viruses

which attack man Many compounds have been tested on experimental virus infections in the chick embryo, but the results do not always tell us how they will act in patients It has been demonstrated that the aromatic diamidines will inhibit virus growth in the chick embryo Pentamidine had some in vitro viricidal effect on feline pneumonitis and meningopneumonitis but no action on influenza and mumps viruses Stilbamidine had a selective effect on mumps virus in the allantoic sac, which suggests that the drug does not act simply by virtue of its toxicity to tissues in general Tissue-culture experiments with mumps and influenza viruses have led to the belief that the diamidines act directly on intracellular virus or set up a chemical blockade which affects a tissue component essential for virus synthesis

Psittacosis Lymphogra

The antiviral activity of extracts of various fruits and vegetables including bilberry, red and black currant, horsechestnut spinach onion carrot, and potato ... li bacteriophages The most potent of ... n maple fruit This completely and ... certain dilutions selectively destroyed the phage leaving the bacterium apparently undamaged The active substance is insoluble in alcohol, ether, or acetone but soluble in water, it can be filtered and heated to 120°C for 10 minutes without loss of potency

Some of the structural analogues of the purine and pyrimidine constituents of nucleic acid inhibit the multiplication of vaccinia virus in chick embryo tissue In American Thompson and colleagues have investigated a series of 5 phenoxythiouracils and related compounds and found that they have little in vitro activity but can be shown to have a definite protective effect in vivo if treatment is begun soon after infection The treated animals have a lower titre of virus in their tissues than the controls suggesting that these substances directly or indirectly retard virus multiplication but are not true viricides The most effective of the 5 phenoxythiouracils has no antithyroid or antibacterial action at concentrations which inhibit the growth of vaccinia virus nor does it affect other viruses Antiviral substances are being looked for among the products of the actinomycetes already a prolific source of antibiotics against bacteria Of 113 culture filtrates tested against the viruses of Newcastle disease and influenza 8 prolonged the life of infected embryos by 24 hours or more, and 3 prevented the death of more than half of the inoculated eggs A strain of *Streptomyces lavendulae* not producing streptothricin has yielded a substance named '*Ehrlicin*", which inhibits influenza viruses A and B and the Newcastle disease virus of it is allowed to act for 2 3 hours before the eggs are inoculated Ehrlicin had a definite inhibitory effect in vivo only on influenza B infections and its suppressive effect on the formation of viral haemagglutinin was reduced when it was injected before, instead of after, infection of the eggs Ehrlicin is a crude substance and the solutions used may contain more than one antiviral agent but there is no doubt about its activity against some viruses In vitro serum destroys its activity but nevertheless it slighly reduces the pulmonary consolidation produced by virus infections in mice Against representative species of bacteria fungi the pox group of viruses, and bacteriophage, Ehrlicin is completely inactive It will thus be sure that no drugs effective against virus disease have yet been discovered (Lancet, 1952 CCLXII, April 26 p 860)

Antiviral substances

Ehrlicin

9. Immunization Against Poliomyelitis

(*Continued from Page 885*)

The failure of chemotherapy in virus diseases has of necessity placed greater emphasis on immunization as a means of control Natural immunity to polio-

myelitis can no longer be attributed to anything other than a previous infection with the virus Nevertheless the part played by antibody is still not fully understood owing in the main to a lack of knowledge of the route by which virus spreads to the central nervous system Furthermore under certain conditions a subclinical infection without recognizable lesions in the central nervous system might develop in these animals indicating peripheral multiplication of virus The recovery of virus from the blood stream of infected chimpanzees early in the incubation period raises afresh the much debated question of vital significance to the problem of immunization whether blood stream dissemination occurs in man Current opinion is in favour of a transient viraemia but it remains to be clearly established

Both active and passive immunization can be used in the prophylaxis of virus diseases The more durable effect of immunization with live virus requires the production of a strain of virus of modified virulence Killed virus vaccines depend for their immunizing effect upon a single antigenic stimulus and usually require booster inoculations Passive immunization although a safe procedure especially with gamma globulin of course affords only transient protection All three methods have been tried in poliomyelitis Vaccines prepared from animal brain tissue containing either killed or a mixture of killed and live virus are capable of protecting animals but are potentially dangerous for man when inoculated parenterally In the absence of natural avirulent strains the emphasis to day is on attenuation of virus strains in the laboratory as has been done with such success in the case of small pox and yellow fever The adaptation of the virus to growth in tissue culture has provided a possible method of attenuation in a medium free from toxic properties Assessment of the effect of prophylactic gamma globulin in poliomyelitis is hampered by the difficulty of dianosing the subclinical infection

A few years ago the prospects of immunization against poliomyelitis were far from bright But the study of the pathogenesis of poliomyelitis in chimpanzees suggested a new line of attack Immunization against poliomyelitis should have as its aim the prevention of paralytic disease Any method adopted should be as safe and as effective as subclinical infection by the natural disease Encouraging results in the experimental animal with vaccines prepared from tissue culture containing attenuated and killed virus given in conjunction with adjuvants have been reported (Brit Med Jour 1952 Sept 6 pp 551—52)

10 Teniasis

(Continued from Page 192)

Quinacrine appears to be a drug of choice in the treatment of *T saginata* the only toxic reaction being nausea and vomiting which are controlled with ease with sodium bicarbonate The patient should have a milk diet on the day before a castor oil or a saline enema is given on the morning of treatment An hour later 0 6 to 0 8 gm of quinacrine hydrochloride is given according to age and size of patient Two tablets of 0 1 gm of the drug are given every five minutes till the whole dose is taken Two to four hours later the purgative is repeated

11 Dermatology

(Continued from Page 1014)

Treatment —The treatment of tuberculosis of the skin has undergone a revolutionary change with the introduction of calciferol which is likely to have a lasting place, particularly in the therapy of lupus vulgaris High rate of

cure can be obtained with carefully calculated long term dosage but as this reduces renal efficiency the patient should be carefully watched Heliotherapy and local measures still hold a very important place in the control of this desease How calciferol works is still not clear but it seems likely that it enhances the specific response of the host s tissues to the tuberculous infection rather than having any direct action on the bacillus itself More recent remedies for tuberculosis offer hope of a yet more speedy control of lupus but as yet none of these seem likely to supercede though they may supplement calciferol The final control of tuberculosis of the skin will occur only with gradual elimination of sources of infection

(Continued from Page 1030 & 1040)

– The effects of the new steroid hormones on skin diseases are dramatic rather than lasting On progressive diseases such as scleroderma and dermatomyositis the effect is symptomatic and not curative on acute disseminated lupus erythematosus it may tide the patient over a crisis but not over the disease on pemphigus the results are not conclusive Periods of natural remission in these diseases should be borne in mind In general these agents may be said to mask and perhaps to buffer, the reactions of the host s tissues and their main use may well be to mitigate the effects of these in diseases having a natural though destructive peak and a good eventual prognosis Of importance also is the use of these hormones as weapons of investigation into the mechanisms of skin pathology *Effects of steroid hormones Skin disea*

(Continued from Page 1060)

The problem of eczema is still unsolved The final unveiling of the processes concerned in this particular pathological state of the skin may well have to await advances in genral pathology The continually increasing number of chemical compounds met with in everyday life provides more and more chances of skin sensitization It seems likely that eczema may repre ent the common expression of a number of difference pathological entities but the final solut on is nowhere yet in sight *E ema*

(Continued from Pa 533)

In the trepon possible Though dermatology, its n was the work don and the demonstra of reproduction i as latency *Penicillin in treponemal diseases*

12 Antibiotics in Skin Diseases

(Continued from Page 1069)

Penicillin is now u ed mainly for acute pyococcal infections and is usually lermatitis am these form of *Contact Dermatitis Penicillin u*

ict on 1000 units per ml does not seem to produce sensitization reactions so readily and may be of value in the treatment of superficial pyococcal infection of the skin

Streptomycin has been used as an aqueous olution for the treatment of infected static ulcers with considerable success reducing pain and inflammation

within a few days. Its most important use is in the treatment of tuberculous infections and some success has been obtained following its use in cases of lupus vulgaris combined with para aminosalicylic acid.

Aureomycin has been found to be extremely effective as a local application in the treatment of pyococcal folliculitis, impetigo contagiosa and secondarily infected dermatitis and eczema. A 1 per cent concentration in emulsifying ointment B.P. makes a satisfactory topical application. It has also given encouraging results in cases of sycosis barbae but here there is a marked tendency for relapse to occur on stopping treatment. So far few reports of skin sensitization reactions or of the development of drug resistant strains of organisms have appeared. Its use orally has been reported to be of value in certain virus infections, e.g. recurrent herpes simplex, herpes zoster and Kaposi's varicelliform eruption. It [illegible] aureomycin has resulted fro[illegible]

Claims have also been made that aureomycin is of great value in the treatment of bullous diseases, particularly pemphigus vulgaris and dermatitis herpetiformis.

Chloramphenicol has been used for the same kind of skin conditions for which aureomycin has been given orally and locally. Results are more or less the same except that this antibiotic has a somewhat different bacterial spectrum over which it is active. It is important to note that both aureomycin and chloramphenicol disturb the normal relationship of the flora of the gut and mucous membranes so that suppression of certain organisms may allow others, particularly monilia (*Candida albicans*), to multiply. This may cause severe stomatitis and ano-genital pruritus as well as more serious infections with monilia.

Neomycin is a new antibiotic not yet generally available which is derived from the organism *Streptomyces fradiae*. Reports from the United States stress the value of this antibiotic when applied locally in 0.5 per cent concentration. It is effective against a wide range of organisms including *Pseudomonas aeruginosa* (B. pyocyaneus). This organism is not affected by aureomycin. It has been suggested that in view of the importance of infection with *Ps. aeruginosa* in some cases of otitis externa, a 0.5 per cent solution of neomycin in sterile water may be effective as an aural instillation. This should not be used if a perforation of the ear drum is present. (Practitioner, 1952, 169, p. 355—356.)

13. Human Trypanosomiasis

(*Continued from Page 321*)

In human trypanosomiasis in Africa, suramin (antrypol, Bayer 205) has proved efficacious in the treatment of early cases. If the disease has advanced to the stage of cerebrospinal involvement, tryparsamide is the most potent remedy. The development of tryparsamide resistant strains has stimulated further research which has resulted in the production of drugs which deal effectively with such strains and which moreover can be used prophylactically to protect persons passing through heavily infected fly country.

Pentamidine (diamidine diphenoxy pentane) in doses of 3 mg. per kg. of body weight will protect for about four months. Care must be taken not to give a prophylactic injection to a person already infected as drug resistance may be produced, rendering subsequent treatment ineffectual.

New potent arsenicals, melaminyl compounds—melarsen, melarsen oxide and mel B, have recently been introduced.

Mel B a compound of melarsen oxide and BAL (British anti lewisite) is capable of dealing successfully with advanced cases by tryparsamide—resistant strains It is advisable that before being taken into use new batches of mel B be tested biologically for toxicity Fortunately we have in BAL an effective antidote to the toxic action of organic arsenic Mel B is given in two series of four intravenous injection of 3 6 mg per kg with an interval of one week between the two series It is rapidly excreted in urine and disappears from the body in 96 hours *Mel B*

14 Amoebiasis

(Continued from Page 310)

, the heal penicillin work has been done on the relative values of sulphonamide and antibiotic treatment on the one hand and the classical emetine emetine bismuth iodide and oxyquinolines on the other Evidence has been produced to the effect that expensive antibiotics such as terramycin aureomycin and bacitracin will remove all traces of amoebae and their cysts and heal the ulcers in a high proportion of cases No one however has *produced results superior to those obtained by established amoebicides the* *Sulphonamide and antibiotic treatment of amoebiases*

Procaine penicillin and a non absorbable sulphonamide such as succinyl sulphathiazole, are probably unsurpassed for this purpose but in order to achieve a high proportion of radical cures in primary cases six injections of emetine followed by a course of emetine bismuth iodide and diiodoquine should be used *in combination* with the antibiotic regime Aureomycin and terramycin are said to be effective especially the latter in doses of 35 mg/kg daily for 7 to10 days

After long experience many workers have abandoned retention enemas as the results do not surpass those obtained by giving oxyquinolines by mouth the strain on the nursing staff is very heavy and the careful concentration of the patients thoughts on his colon and rectum is undesirable

For the initial stages of metastatic amoebiasis of the liver and lungs emetine by injection still holds pride of place but two tablets of chloroquine given three times a day for ten days after three days of emetine therapy give satisfactory results with fewer toxic effects than when emetine alone is given for a prolonged period Chloroquine may be combined with diiodoquine Neomycin has been tried but is toxic

15 Plague

(Continued from Page 850)

The slight but definite effects exercised by soluble sulphonamides in the treatment of bubonic plague led to the widespread use of these drugs in India but streptomycin has now been shown to have a greatly superior action and given by injection every six hours during the early stages of the disease is the best therapeutic measure at present available The drug is given in doses of 4 g daily but doses can be safely reduced on the third and fourth day After 5th day it is replaced by sulphadiazine 4 g daily In severe *Sulphonamide and streptomycin*

septicaemic or pneumonic plague initial dose of streptomycin is supplemented by oral aureomycin terramycin or chloramphenicol Contacts should be given 2 to 3 g of sulphadiazine daily for five days

16 Cortisone and A C T H

Three years ago Hench and his colleagues announced that they had been able to suppress the symptoms of rheumatoid arthritis by the administration of Kendall's compound E now called cortisone and of A C T H (adrenocorticotropic hormone) This claim has subsequently been amply confirmed It is important to realize however that it is suppression and not cure of the disease which is achieved by the use of these hormones and thus relapse is usual soon after their administration is stopped They are difficult to procure and expensive and their prolonged use which is necessary in a chronic disease such as rheumatoid arthritis is apt to produce undesirable side effects Until these disadvantages have been overcome the use of cortisone and A C T H cannot be recommended as a routine

Their clinical suppressive effect is remarkable and improvement generally occurs in the following sequence First stiffness is relieved, and then pain tenderness and swelling of the affected joints Fever if present disappears and the patient's appetite and weight increase All this is accompanied by a sense of well being which will often amount to euphoria Cases in which the joint changes are potentially reversible will become practically symptom free in seven to ten days although some will continue to manifest minor signs of activity of the disease The E S R falls and the anaemia tends to revert to normal as do the plasma proteins

The dosage of cortisone originally recommended was 300 mg on the first day 200 mg on the second day and subsequently 100 mg daily Recent workers tend to adopt a lower scale and endeavour to maintain the patient on the lowest possible dosage consistent with reasonable comfort since in this way the risk of side effects is lessened Some patients can be maintained on a daily dosage as low as 50 mg or less with reasonable efficiency Cortisone can be given either by injection or in slightly higher dosage by mouth A C T H has to be given by injection every six hours 40 mg of A C T H is roughly equivalent to 100 mg of cortisone

The chief side effects produced by these hormones are the result of their excessive physiological action and consist principally in sodium retention (œdema) potassium excretion (muscle weakness) excess of sex hormone production (acne hirsutism [illegible] ...ate metabolism (diabetes) and cerebral stimulation [illegible] in the form of Cushing's syndrome may also [illegible] ...portant side effects will include pigmentation alteration in the facies striae rise in the blood pressure tachycardia and irregularity of the monthly periods Wound healing may also be delayed and the symptoms of the onset of acute inflammatory disease such as appendicitis may be masked The chief contraindications to the use of cortisone and A C T H are incipient heart failure from any cause thrombosis diabetes hyperpiesis renal or tuberculous disease and an unstable personality

The mode of action of these hormones is completely unknown With further experience of their use together with technical improvements which should result in a prolongation of their action and the elimination of side-effects they will take their place as a very valuable medical treatment in selected cases It is unlikely however that their use will ever entirely eliminate the need for the

use of the other less specific types of treatment which have been briefly described above (Brit Med Jour, 1952 May 31 p 1187)

17. Heat Exhaustion

One mg of ergotamine tartrate with 100 mg of caffeine is effective in controlling symptoms Caffeine is a powerful central nervous stimulant Ergotamine constricts blood vessels and in this way raises blood pressure

18 Treatment of Cancer

Radioactive cobalt 60 is one of the most suitable of few radioisotopes which have proved effective therapeutic agents in medicine Cobalt 60 is an efficient relatively cheap substitute for radium and in many ways it appears to be a more suitable isotope than radium Radioactive cabalt offers much greater flexibility and accuracy in physical planning of treatment than is possible with radium needles In carcinoma of cervix stainless steel tubes containing radioactive cabalt wires can be used Radiocobalt sources can be used as surface application In cavities beads containing cobalt may be used Radioactive cobalt solutions in thin walled rubber containers have been used in irradiation of vagina uterus and bladder If absorption occur it is readily eliminated *Radioactive cobalt 60*

19 Treatment of Trachoma

An ointment containing 2 5%
been first removed with 5% sodi
chloramphenicol and aureomycin
is useful in the treatment of blastomycosis

20 *Syphilis and Other Treponemal Diseases

(*Continued from Page 485*)

Disease conditions with treponemes as the causal agent occur in all parts of the world It is mainly in tropical areas today however that these diseases remain in high endemicity Treponematosis in high incidence was not always confined to tropical areas The Morbus Gallicus which assumed epidemic proportions in 16th century Europe was undoubtedly treponemal in origin *Introduction*

Much evidence is accummulating in support of the unitarian theory of Treponematosis It has been suggested that the various clinical manifestations portrayed by the ... [illegible] ...onmental circumstances
ch [illegible] governing the dosage
ar [illegible] means of classification
w[illegible] primitive environment of West Africa where soap is unknown at one end of the spectrum and the super sanitation of an American city at the other end a biological gradient of treponematosis can be built up as follows —
(1) Yaws in Africa (2) Bejel in the Middle East (3) Pinta in South Ame[illegible] (5) High incidence rural syphi[illegible] nd hill areas of Jammu)
(6) [illegible] the Western world

* From notes kindly Supplied by J S McKENZIE POLLOCK W H O Regional Advisor for S E ASIA in Venereal Disease and Treponematosis

No morphological difference can be demonstrated in the organism or organisms causing this spectrum of disease It is therefore convenient to treat them as one group for therapeutic purposes

The World Health Organisation Expert Committee on Venereal Disease and Treponematosis at its meeting in July, 1952 agreed that penicillin alone was the drug of choice for the treatment of this group of diseases These indications are that yaws pinta bejel endemic and venereal syphilis respond equally well to penicillin therapy A high percentage of cures are achieved as judged by clinical and serological evidence provided the theoretical therapeutic blood level is maintained over a period of time With this in view when dealing with ambulatory cases a long acting preparation of penicillin is desirable Procaine penicillin G in oil with 2 per cent aluminium monostearate (P A M) has been found satisfactory Dosage schedules as suggested by the World Health Organisation Expert Committee are given below A high initial dose is recommended to achieve a reasonable result in the event of the patient not appearing for further treatment It is considered that *a high percentage of clinical and serological cures will result from a single injection of 1 8 mega units of P A M*

With regard to public health practice in treponematosis where mass compaigns are being undertaken and where cost and ease of adminisration are of primary importance the community as a whole is under consideration and calculated risks can be justified *A single injection of 1 8 mega units P A M will result in a significant number of cures Few proved relapses are recorded on this treatment schedule The dose of P A M will render the great majority of infections cases non infectious, which is in itself a worth while public health measure*

Because of its viscous nature it is recommended that a No 18 gauge needle be employed for the administration of P A M It is best given deep into the upper and outer quadrant of the buttock

The introduction of the standardised cardiolipin antigens and the employment of simplified techniques have made possible the use of serological testing on a much wider scale than formerly These antigens have an increased degree of specificity and give rise to fewer false positive results It must be realised how ever that these tests are not specific for treponemal infection and their interpreta

[illegible]

Laboratory (V D R L) procedure In the larger serological centres it is customary to employ a battery of screen tests as a precaution against one of the tests being faulty

Certain basic principles must be remembered when interpreting serological results The serological tests available to us at the moment do not become positive until the treponemal infection has been established for some weeks In the early stages dark field examination for the presence of motile organisms is a valuable aid to diagnosis Where clinical suspicion exists but the serological result is negative, a further test should be undertaken after a period of 4 6 weeks

In the normal untreated course of these diseases a spontaneous titre drop can be expected in old infections Many late latent cases become sero negative with out treatment Sould this be suspected the cerebro spinal fluid may show evidence of infection

Serological results must be interpreted in conjunction with the history of the patient and the clinical findings

Criteria of C

Quantitative serology can be a great help in assessing the response to treatment A titre drop following treatment usually indicates a favourable response In clinical practice serological testing should be carried out at six monthly intervals for at least two years following treatment In mass campaigns this ideal can be rarely achieved

Following successful penicillin therapy in established infection the serology will remain positive for many months A titre fall will be recorded in many cases two months following successful treatment but it may be one year or more before the blood returns to a sero negative state

A small percentage of individuals are what is known as Serofast In their case following treatment for established infection their blood remains sero positive for the rest of their lives without any evidence of active disease When such cases are encountered it would appear wise to repeat the course of treatment

A rising titre can be interpreted as an indicator of advancing infection

Summary and Conclusion

Penicillin has now been used for over 10 years in the treatment of all the clinical forms of treponematosis It has been proved to be an efficient therapeutic agent in this group of diseases A single injection of 1 8 mega units will result in a significant number of cures The addition of arsenicals to penicillin therapy do not seem to improve the results achieved These have therefore been discarded though bismuth compounds still have supporters

Following clinical cure under penicillin therapy in the earlier stages of infection, reinfection can occur The concurrent treatment of contacts therefore becomes desirable

In conclusion it can be stated that single injection therapy in treponematosis using 1 8 mega units P A M has been proved an efficient public health measure A calculated risk is involved For the treatment of individual patients clinical judgement with the aid of repeated serological tests must still be the approach recommended in the treatment of treponematosis

Latent and L Syphilis

Because of its demonstrated superiority over previously available forms of therapy penicillin is the treatment of choice also in other forms of syphilis Detailed optimum schedules of therapy could not be recommended at this time but in no case should less than 4 8 mega units be given to patients with late or latent syphilis

Although sufficient time has not elapsed to judge the insurance value of penicillin therapy in late latent syphilis vis a vis the known effectiveness of arsenicals and bismuth the committee found no reason to believe that it will prove to be inferior in view of the known efficacy of the antibiotic in neuro syphilis and so called late benign syphilis

Syphilis in Pregnancy

At least one serologic test for syphilis should be carried out during each pregnancy whenever possible a second test should be made in the last trimester Treatment with penicillin alone should be given as soon as a diagnosis of syphilis in pregnancy is established the amount should not be less than 4 8 mega units of P A M When facilities for clinical and quantitative serological examination thus assurance of adequate follow up are not available penicillin treatment might be repeated during each subsequent pregnancy

In the light of increased experience with the use of penicillin in early con

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ternative for aqueous penicillin

ital The treatment of late congenital syphilis is the same as that used in late acquired syphilis with adjuvant therapy (e.g. cortisone locally for interstitial keratitis)

SPECIMEN TREATMENT SCHEDULES OF SYPHILIS WITH PROCAINE PENICILLIN G IN OIL WITH 2% ALUMINUM MONOSTEARATE P A M IN THE INDIVIDUAL CLINIC PATIENT

Primary Syphilis

Mega units of P A M / Days

1	2	3	4	5	6	7	8	9	10	11	12	13
24												
12	—	—	—	12								
12	6	6										
12	—	6	—	6								
12	—	—	6	—	—	6						
12	—	—	—	6	—	—	—	6				
12	3	3	3	3								
12	—	3	—	3	—	3	—	3				
12	—	—	3	—	—	3	—	—	3	—	—	3

Secondary Syphilis

Mega units of P A M / Days

1	2	3	1	5	6	7	8	9	10	11	12	13	14	15	16	17
48																
24	—	—	—	24												
24	12	12														
24	—	12	—	12												
24	—	—	12	—	—	12										
24	—	—	—	12	—	—	—	12								
24	6	6	6	6												
24	—	6	—	6	—	6	—	6								
24	—	—	6	—	—	6	—	—	6	—	—	6				
24	3	3	3	3	3	3	3	3								
24	—	3	—	3	—	3	—	3	—	3	—	3	—	3	—	3

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